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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Forthcoming Events.

FEBRUARY 22.

Swansea Technical College Metallurgical Society:—General meeting at the Technical College, Swansea. "The Estimation of Nickel and Copper in Steel," Paper by W. L. Knoyle.

FEBRUARY 25.

Sheffield Metallurgical Association:—Ordinary meeting. "Modern Developments in Open-Hearth Furnace Design," Paper by A. Vincent Kemp.

FEBRUARY 27.

Institute of Metals (Birmingham Local Section):—Ordinary meeting at Birmingham. "Creep of Metals at High Temperatures," Paper by R. W. Bailey, B.Sc.

Institute of British Foundrymen.

FEBRUARY 22.

Newcastle and District Branch:—Ordinary meeting at Neville Hall. "Moulding Sands," Paper by C. Presswood.

Birmingham, Coventry and West Midlands Branch (Junior Section):—Ordinary meeting at Birmingham. "Modern Foundry Methods," Paper by D. Winkinson.

FEBRUARY 28.

Birmingham, Coventry and West Midlands Branch:—Visit to works at Coventry, followed by Lecture on "Aluminium Castings," Paper by A. Harley and F. H. Huvren.

Birmingham Section of the British Industries Fair.

We have never been too enthusiastic in our support of the Birmingham Section of this enterprise, as we disliked the site chosen—Castle Bromwich—because of its remoteness and the lack of adequate hotel accommodation in Birmingham—a factor applying with equal force to any British provincial city. We must confess, however, that, despite these acknowledged deterrents, the Birmingham Section of the British Industries Fair is going from strength to strength; each year sees more space being taken, and one hears of more business being done. This annual manifestation is the real foundrymen's exhibition, as no less than 25 to 30 per cent. of the exhibitors possess their own foundries. The foundry exhibitions which have been held with such success at the Agricultural Hall really constitute displays of foundry equipment and supplies with the foundry industry as the buyer, but at Castle Bromwich the foundry owner takes the rôle of supplier. However, quite a number of foundry equipment manufacturers have taken space, and between them cover most foundry requisites from cupolas to sand blast. The raw material side, is, however, somewhat neglected. Refractories, non-ferrous alloys and core oils are, however, included. In plant there are three firms exhibiting moulding machines; two handle cupolas, and two or three mechanised riddles. Transport apparatus is treated by numerous exhibits, ranging from the simple wheelbarrow to roller conveyors. For the treatment of castings from the mould to the despatch there are exhibits of portable grinders, tumbling barrels, sand-blast and welding apparatus. Patternmaking has also been covered. We are never quite satisfied with the way patternmaking machinery firms reach the foundries. Some show at the Machine Tool Exhibition, some at the Foundry Exhibition, and still others at Castle Bromwich. None of them has up to now had a really representative display, whilst, if they all could make up their minds to utilise one exhibition normally visited by the whole of the foundry industry, we would strongly counsel our readers to make a journey for the sole object of inspecting the exhibit.

The foundry capable of making any casting economically does not exist; each is governed by weight, type, quality and quantity considerations. Each is, however, capable of expansion within those limitations, and we insist that every foundry executive should visit the exhibition and catalogue the types of castings capable of economically entering into his production, and replacing jobs showing little or no profit. This latter work will usually be profitable to firms specially laid out for its production.

The New Educational Scheme.—II.

In our recent comments on the proposals for foundry education, we dealt chiefly with the need for craft training. In addition to this, however, there is an obvious need for a professional certificate which would appeal both to the more highly educated individuals entering the trade and to the more able and progressive among the craft apprentices. This need is the greater in view of the very small number of University-trained men who enter the industry on the professional side. It would be an award parallel to the certificates that are already available on a national basis in mechanical engineering, electrical engineering, chemistry and naval architecture. The closest relationship would be with mechanical engineering, of which in a certain sense founding may be regarded as the base. Moreover, since the number of students who would come forward in different parts of the country would probably be insufficient to ensure a complete set of totally independent classes in each area, some degree of linking up with kindred subjects is essential. It is, therefore, a very important advantage to the present scheme that classes for the certificate in mechanical engineering are carried on in many parts of the country. The subjects that are deemed important to the engineer are, after all, in many respects the subjects that are important to the founder, and it is a fact that the present engineering courses could be slightly modified to include other matters important to the founder without introducing serious irrelevancies. Current engineering courses, it is often felt, tend to pay too much attention to the purely mathematical aspect of the subject, as if it were intended that all engineers should become designers. In these days, when it is desirable to make technical training equally attractive to foremen, production engineers, buyers, salesmen, etc., it might be a real advantage if the courses were slightly modified to include those subjects which are basic to founding and therefore no less basic to engineering.

Under this aspect of the scheme, an ordinary national certificate would be awarded at the end of an approximate three years' course from the age of sixteen. This certificate would cover in the main the same subjects as the existing

national certificate in mechanical engineering, but with a bias towards founding, probably introduced in the last year, and including such necessary auxiliary subjects as chemistry. A course of this kind, involving at least three evenings per week for three years, might be followed by a further two-year course for a higher national certificate. In this course both foundry metallurgy and technology would be carried to the highest stage of specialisation, and such subjects as works organisation, costing and management would also be included. As in the case of the craft certificate, it appears that it would be impracticable for the Institute of British Foundrymen to grant its own certificates, chiefly on account of the high cost of the necessary organisation. The whole scheme could be carried out in conjunction with the Board of Education and the Institution of Mechanical Engineers, which already has in existence the machinery for the National Certificates in Mechanical Engineering to which we have referred previously.

Institute of Metals.

A meeting of the London Local Section of the Institute of Metals was held on February 13 at the Society of Motor Manufacturers and Traders, Limited, 83, Pall Mall, London, S.W.1. A Paper entitled "Temperature Measurement and Control in Works" was read by Mr. H. H. Smith, who, by means of a series of lantern slides, described carefully various instruments used for taking temperatures of metal, pointing out the advantages and disadvantages of certain of these. He emphasised the importance of care being taken of such instruments, and said that, although pyrometric apparatus had been brought to a high standard of perfection, it was essential that every part should be tested periodically.

The meeting was presided over by the Chairman of the Section, S. W. Smith, D.Sc.

Falkirk's Industry.

Industrially Falkirk at the present time is suffering from a severe depression which is having its inevitable effect in increasing the number of unemployed and under-employed workers in the district. According to a prominent trade union official, the situation is as bad, if not worse than it has been at any period since the war. Manufacturing firms in the light castings industry are finding it extremely difficult to procure orders, and there are very few if any foundries in the district affording their workers full-time employment. A large number of the works are operating on only three days per week, but one or two are finding it possible to keep the plant in operation on four days weekly.

A reflection of the situation has been found at the Labour Exchange in Falkirk, where the number of short-time workers seeking benefit is being steadily and regularly added to; the number is already several thousands. The officials of the Ironfounders Workers' Association (Central Ironmoulders) said that the number at present on the roll as totally unemployed is actually slightly less than at the corresponding period of last year, but the number of members on short time is considerably larger. The records of the General Ironfitters' Association show that within recent weeks there has been a serious increase in the number of members unemployed. On November 30 there were 80 unemployed members, but at the end of January the number drawing full unemployed benefit was 300. The opposite experiences of the two Associations may be accounted for by the fact that such orders as the foundries are receiving are for unfitted goods such as rainwater pipes and connections.

Publications Received.

Welding.—The A. W. P. Bulletin, No. 62, issued by Alloy Welding Processes, Limited, of Ferry Lane Works, Forrest Road, London, E.17, is of real technical interest to our readers, as it contains a series of 20 microphotographs, all at 100 dias., and four others at diverse magnifications. This last series have been taken from the British Boiler & Electrical Insurance Company's Report. As this excellent brochure is of maximum value to the metallurgist and only of limited interest to the engineer, we suggest that the description of the preparation of the samples is superfluous. We further suggest that a series of experiments whereby various welding-rod materials are deposited on various steels and ground flat would be illuminating, as showing the soundness of the weld metal. Pin-point pictures of welds are only of academic interest, whereas macro etchings are truly significant.

No photographs are included of cast iron. On page 7 it is stated that "some writers are prone to describe the metal deposited by an electrode as a casting. It is evident that by no stretch of the imagination could the metal shown in Figs. 9 and 10 be described as possessing the characteristics of a cast metal, and we make no effort to explain why it should assume this fine normal structure." The micros. referred to are certainly most interesting, and we can only ascribe it to some phenomenon related to a migration of structure analogous to the migration of elements in the solid state in steels under suitable heat-treatment.

Modern Methods of Coal Production and Shipment.—This beautifully produced book has been published by the Yorkshire Amalgamated Collieries from their office at 5, Commercial Street, Sheffield. It is printed on the right-hand page only, and is delicately illustrated by a process which gives the impression of being aquatints. There are 16 pages, which by means of a series of short descriptions create a clear impression of a great enterprise, alive alike to their potentialities and responsibilities. We congratulate those responsible for this artistic production.

Modern Industrial Furnaces, No. 2.—This bulletin is issued by Stein & Atkinson, Limited, of 47, Victoria Street, London, S.W.1, and contains articles on the "Installation and Operation of Gas-Producers for Metallurgical Furnaces" by Mr. J. S. Atkinson; "Normalised Steels and Tinplates" by Mr. E. E. Griffiths; "The Niernkoff System of Port Construction for Open-Hearth Furnaces" by M. Gregoire Niernkoff; and "Recuperation" by Mr. D. A. S. Williams.

Handbook for Investors, 1930.—Published by Fred. C. Mathieson & Sons, 16, Copthall Avenue, London, E.C.2. Price 5s. This useful work of reference gives the Stock Exchange prices and dividends for the past ten years for a number of selected securities.

German Enterprise.

We have received from a German source an itinerary of a "Study Tour for German Engineers in the United States of America." Apparently it is the organiser's fourth annual effort in this direction. We notice that the party will be in Cleveland, Ohio, on May 28, the week after the A.F.A. Convention closes. We suspect the organiser of this tour is the person who took charge of an unofficial trip in 1926, and if any of our readers have also received invitations to participate, we think it should be understood that it is in no way an official party. Our own view of the matter is, that such unofficial excursions are against the best interests of international technical co-operation, as it may impose too much upon the well-known generosity of American industrialists.

Random Shots.

A minor sensation was created in London the other day by the deputation of Bilston bath-makers who drove to the Board of Trade in a lorry in order to protest against the dumping of foreign baths that is stated to have taken place so extensively recently. Whatever else they may or may not have achieved—and it is, after all, too soon to determine that—they undoubtedly achieved publicity. Anything in the nature of a "stunt" is held by the Press, apparently, to constitute news, and there is some justification in the theory, if we are to judge by the crowds who can invariably spare time to have a look. It is popularly supposed that Londoners are unique in their ability to find time for an accident, a wedding, or a Lord Mayor's Show; I have lived in London and out of it, and my experience is that human nature does not vary a great deal in such respects. Though I daresay a lorry-load of working men would arouse less comment in a Midland or Northern city than in the Metropolis. To return to our bath-makers; they were courteously received and told that their complaints would be considered. Would anyone ask more of a Government Department? I suppose they might if their bread-and-butter appeared to depend on safeguarding for the light castings industry, but they would assuredly ask in vain.

* * *

What the foundry trade was like some years ago may be gleaned in part from the reminiscences of a recent speaker in Middlesbrough (Mr. W. H. Meadowcroft). Talking of the time when it was considered a necessary part of the young moulder's training to go on the road, he told of the Sheffield householder who advertised: "Wanted, men lodgers. No moulders need apply."

* * *

There was also the instructive tale of the man who encountered in a country district a smithy and general hardware shop, displaying a notice, "Wanted a moulder." He obtained the job on declaring that he could work the cupola, and was told that he had better clear up the little foundry for a start, as it had been idle for some time. When the boss came to have a look, he began whittling away at a big turnip, and, being called out of the smithy to attend to something else, he left this turnip on a bench. In the course of his clearance the moulder reached this bench, and dumped turnip and peelings where they seemed to belong, on the rubbish heap. "Where's that turnip gone?" the boss asked when he came back. The moulder told him it was on the rubbish heap. "I thought you'd done with it." "Done with it be hanged! That was a wheel pattern, six off!"

* * *

Instructive, but rather depressing, figures are now obtainable as to British iron and steel production, both in the past year and over the period of several years just ended. In particular, take this one for pig-iron. In the five years ending December 31, 1928, the world's output of pig-iron increased by 29.6 per cent., while British production decreased by 9.6 per cent. There is a similar comparison for steel, relating to the years 1920-28. The world's output of steel increased from 71,300,000 tons to 108,060,000 tons, while British output of steel decreased from 9,070,000 to 8,520,000 tons. It is, however, encouraging to note that in so far as the figures for 1929 can yet be determined, they are higher than in any recent year. The trouble is that our production is still behind its pre-war level, and consequently very far behind our pre-war share in the world's total. The seeds of prosperity that an enthusiast may find in the records of 1929 will need to be very carefully tended and watered if they are to come to fruition.

Marksman.

Some Aspects of Jobbing Moulding.*

By S. Southcott.†

The subject of this Paper is one of especial interest and importance to the engineering trades and foundry industry, as insufficient attention has been given to it, particularly to the practical side. However, one cannot but evince admiration of the strenuous efforts that have been made in the scientific direction, but one must deplore the lack of endeavour put forward by progressive work on the practical side—hence the author's desire personally to raise the question of jobbing moulding.

The industry to-day is passing through a stage of development unparalleled in its long history. It is slowly, but surely, emerging from its lethargy and stepping into the first rank of importance; it is rapidly becoming an industry apart from the machine-shop side of engineering and its finishing processes. In time the moulder will, in addition to producing the required article in its rough state, be able to bring it forth in such a perfect condition as to obviate the necessity for putting them through the finishing shop for any purpose. Proof of this will be found in the die-casting process and also in that of pressure casting.

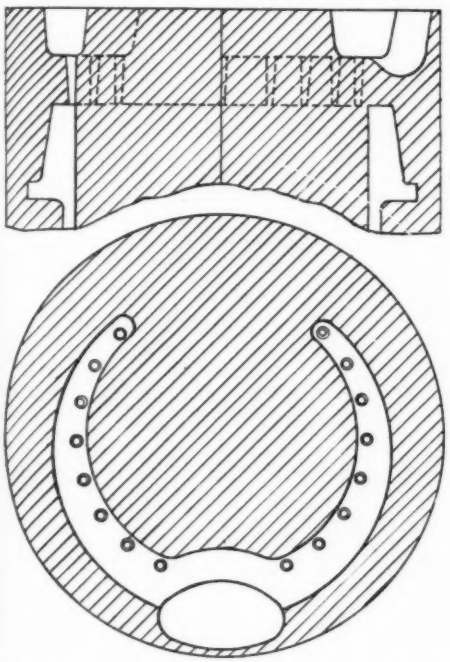


FIG. 1.—A WELL-DESIGNED RUNNER WITH ARRAY OF PENCIL GATES FOR LARGE TUBES, CYLINDERS, ETC.

Standardisation is quickly becoming the rule, which must in a large measure eliminate some jobbing moulding, but, in spite of this, a certain amount of jobbing will have to be undertaken. Therefore, as it is proposed to deal with some of its aspects, a consideration of some of the problems arising thereon will be given in the hope that it will serve some useful purpose.

A jobbing shop is sometimes looked upon as an ironmongery stores on a large scale. It is generally called upon to produce anything in metal from, let us say, a safety-razor blade to a high-pressure cylinder or some other large casting such as are illustrated in Figs. 10 and 12. It is required to provide anything that can be cast in any metal. For instance, in the author's experience he has been called upon to produce bronze vanes for fans, and at the same time a 40-in. cylinder and other large castings in connection with a breakdown at one of the neighbouring steelworks—guide-bars, piston-valve, pistons, cylinder-covers and portions of beds for a cogging-mill engine. Each job has to be delivered on time, so the importance of the jobbing shop and its relation to the engineering trade may readily be seen. The sand problem is gradually being solved by machine preparation and so forth, and the extensive use at present made of them.

Gating.

This is one of the primary question that confront the jobbing moulder and one of the chief causes of half the foundry troubles. Bad gating means bad castings; one cannot produce a clean casting if the metal passes through a dirty gate. Up to the present time no melting process will in the first instance produce metal clean enough to allow of jobs being poured without proper gates. Consequently, strict attention should be paid to gates and runners; the basin should be large enough to hold more than sufficient metal to keep the runners full, and also a good head during pouring; down gates should be sufficiently large to keep the in-gates quite full, which is of the utmost importance, as otherwise it often leads to trouble.

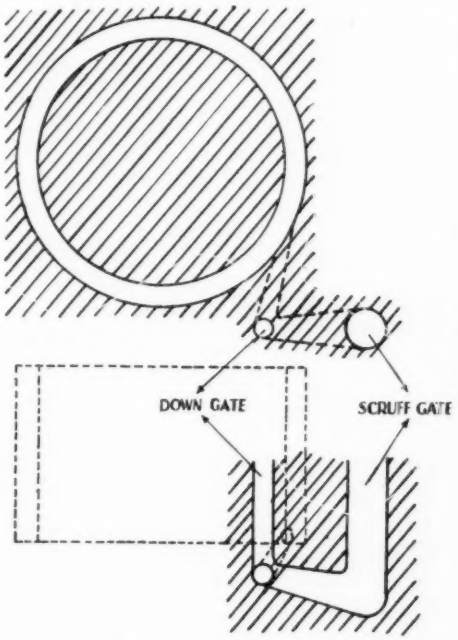


FIG. 2.—GATE USED FOR WHEELS AND PISTON-RING CASTINGS.

Pencil Gates.

A cylinder casting of any dimensions, in order to produce a sound casting, should be cast on end. It is suggested that small round pencil gates be used for this class of casting and run, of course, on top, as shown in Fig. 1. This type of gate has been used for all cylinder castings, condenser-sleeves and other castings which required machining all over. It has been found that from nine to twelve gates of $\frac{5}{8}$ in. dia. at the point have been sufficient to run a 40- or 28-in. cylinder. It is, of course, quite clear that, owing to the port core, gates cannot be placed all round the top. Here there is a large well holding sufficient metal and the inlet big and open enough to keep the runners amply filled. This type of gate was used for all the cylinders the author has cast, and, without exception, clean sound castings have been obtained without a single scruff or shot-hole in the bore or on any of the machined faces.

Bottom or Swirling Gates.

The gate shown in Fig. 2 was used for casting piston rings, etc. (which should be cast open), and of a very high standard of engineering work. It will be noted that there are two very important points about this gate. It looks as though it has two down gates—but there is only one—the other is what is termed a "scruff head." This gate is so cut that the first wash through the down-gate carries most of the dirt found in down-gates through the bottom into the scruff-gate before it reaches the inlet in the mould, the result being that only clean metal enters the mould. The metal, when entering the mould, takes a quick swirling motion, carrying all scruff and so forth before it, which remains on top of the metal until the mould is filled, thereby producing the sound, clean casting. It has been found that, by covering the scruff gate low down, better pressure is given to the mould. A bad gate such as is shown in Fig. 3 can create wasters.

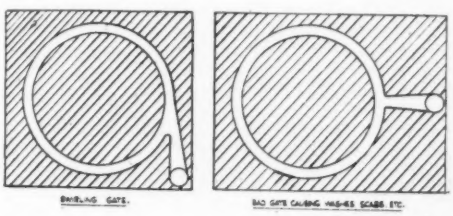


FIG. 3.—GATE FOR PISTON-RING AND ALL ROUND CASTINGS.

FIG. 4.—HORN GATE FOR BOTTOM PRESSURE, OFTEN USED FOR RUNNING TWO OR MORE CASTINGS.

Gates for heavy machine casting or any deep flanged casting requiring forcing, etc., and the prevention of scruff or air leaving the gate-well, present a more difficult problem than appears on the surface, and moulders are more prone to carelessness on this point than on any other in their selection of suitable down and intake gates. One frequently encounters a moulder taking a very small down-gate and attempting to keep inlets of twice or three times their full volume, and generally, when this happens, there is in the immediate vicinity of the inlet a large piece of porous, scruffy metal which always gives trouble. Whilst admitting that too much force should not be used at the entrance of inlets of this description, care should be taken that down-gates should be large enough to keep all inlets up to their fullest capacity, and with a suitable well this class of gate—if properly looked after—will afford every satisfaction.

Small castings call for closer attention. It is really a subject for a separate Paper, and beyond stating that each small casting requires a different type of gate, and they must be used accordingly, the subject will be dismissed.

* A Paper read before the Wales and Monmouth Branch of the Institute of British Foundrymen, at Cardiff, Mr. Kinsman presiding.

† The author is with Messrs. Taylor & Sons, Limited, of Briton Ferry.

Several types come under review, such as pencil or top gates, cardboard gates for very thin casting, horn gates, small swirling gates, and others.

The horn gate, Fig. 4, is popular with a large number of people, and although it has its drawbacks it has on several occasions proved invaluable to the author, especially in running pinions of all descriptions. Some helical tooth pinions were on one occasion quite an awkward type of casting which everyone thought required some sort of feeding. However, after some trouble by running with a pencil gate on top and a feeding head, the author decided to run them with a horn gate with a small head on the top edge, sloping the mould towards the head and no feeding. This gave every satisfaction.

Runner Bushes.

Question-time may reveal some interesting points on this subject.

Fig. 5 shows an array of good and bad gate wells. No. 1, for a double down-gate, shows a good gate and one that should be used for all such runners. It will be noted that there is a deep centre between the two down-gates with sufficient width to hold a good head of metal. Then there is a substantial bank which prevents the first wash of metal going into the down-gates. No. 2 shows the reverse; the well is shallow; the metal on entering spatters all over the place, and every particle of dirt in the

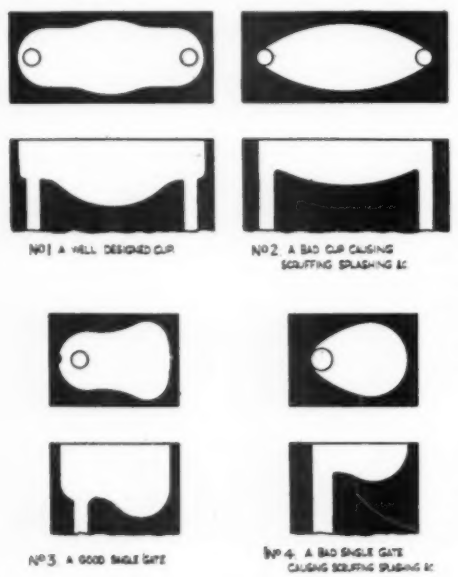

No1 A WELL DESIGNED CUP
No2 A BAD CUP CAUSING SCRUFFING SPLASHING &c
No3 A GOOD SINGLE GATE
No 4. A BAD SINGLE GATE CAUSING SCRUFFING SPLASHING &c

Fig. 5. Some Types of Gates.

gate at once runs in front of the metal into the down-gates. There is no head of metal here, and all scoria leaving the ladle must naturally enter the mould. There are probably more injuries through burns from this class of gate than from any other type. Nos. 3 and 4, of course, explain themselves as a single gate.

Feeding.

This operation is the most ill-used and misjudged of all connected with sound castings, and oft-times occasions more harm than good. Some founders can, no doubt, remember when feeding was done on almost every casting of whatever design. It was then to be observed that moulders were rarely without rods whilst casting. As a result of the little experiments personally carried out, the author has arrived at the conclusion that the less founders dabble with wrought-iron rods in cast iron the better for all concerned. He has seldom come across a casting which had to be machined all over show solid where feeding head had been placed. Where feeding with wrought-iron rods has been done, it shows badly when castings have been machined. It is therefore suggested that where feeding is absolutely necessary it should be done at the highest possible point and as far from machining parts as practicable. This is demonstrated by some of the following illustrations. Recently the author had an opportunity to carry out a very interesting experiment in this direction. Some square blocks were required which, as usual, everyone thought needed extra feeding; they had always previously been fed and had never given satisfaction, so after some trials and failures it was decided to cast them without a head of any description, using smaller gates of the horn type and no feeding other than a small quantity of metal after the mould was filled, and without exception they turned out quite solid and to everyone's satisfaction. Subsequently one was made using the old method with a good head on top, and was well fed as had always been done. Afterwards one was made without head and no feeding, followed by another in open sand, allowing $\frac{1}{2}$ in. for sinking. The three of them were broken; the one cast open had sunk down a little in the centre, the one without head and no feeding was quite solid, and the other fairly solid but where fed it showed a bad porous patch—hopeless for machining.

Moulding a 28-in. Cylinder.

Making a 28-in. cylinder with steam-chest combined is not a very easy job to undertake without careful consideration. It was one of the jobs the author was called upon to undertake during last year, an urgent job which had to be put in position on time. Fig. 6 shows it to be a most intricate piece of work, a cylinder of the old type with a difficult steam-chest attachment. It necessitated very careful thought, and it was decided to cast it on end with a head ring which would almost cover the top flange and 1 ft. 6 in. deep; the runner was to be of the pencil type, exactly similar to Fig. 1. This large head ring was to carry all dirt and scruff out of the casting and to provide sufficient molten metal on top of casting for feeding during freezing. Tackle had to be made to cover the whole job; the first item was the bottom plate, which was made strong enough to carry the whole of the work of the mould and to bear the strain of cramping for casting. The casting at its widest point was 6 ft. 3 in., or from centre of bore to tip of foot 2 ft. 10 in., from centre of bore to farthest point opposite 3 ft. 3 in. A plate would, therefore, have to be made large enough to carry a job of 6 ft. 1 in. across points in addition to carrying sufficient brickwork for the job. Consequently, there must be provided a plate at least 8 ft. in dia., at least $2\frac{1}{2}$ in. thick, with lugs for lifting and carrying, and also a bottom-carrying ring of the same diameter to part on top of the bottom flange. This also should be strong enough to carry all the work from flange to middle joint, covering the bottom flange and having sufficient slack or play for loam between it and the casting. One face should be gauged to carry loam over flange, then the middle parting-plate without gauges but with sufficient slack, now around the inlet and outlet ports. Additionally there will be required the top plate for covering, and carrying-plates for the head ring (this plate to have holes for gates and heads), the covering plate for the steam chest and the core-irons for the steam-chest cores, etc., and the centre core-iron for carrying the core into position (this iron to have four "T"-head holes for bolting and a centre hole for keying to the spindle). These are the whole of the plates for the job.

Making of Outside of Mould.

Attached to the wall there is a plate 6 ft. long by 1 ft. 6 in. wide, Fig. 7, containing two

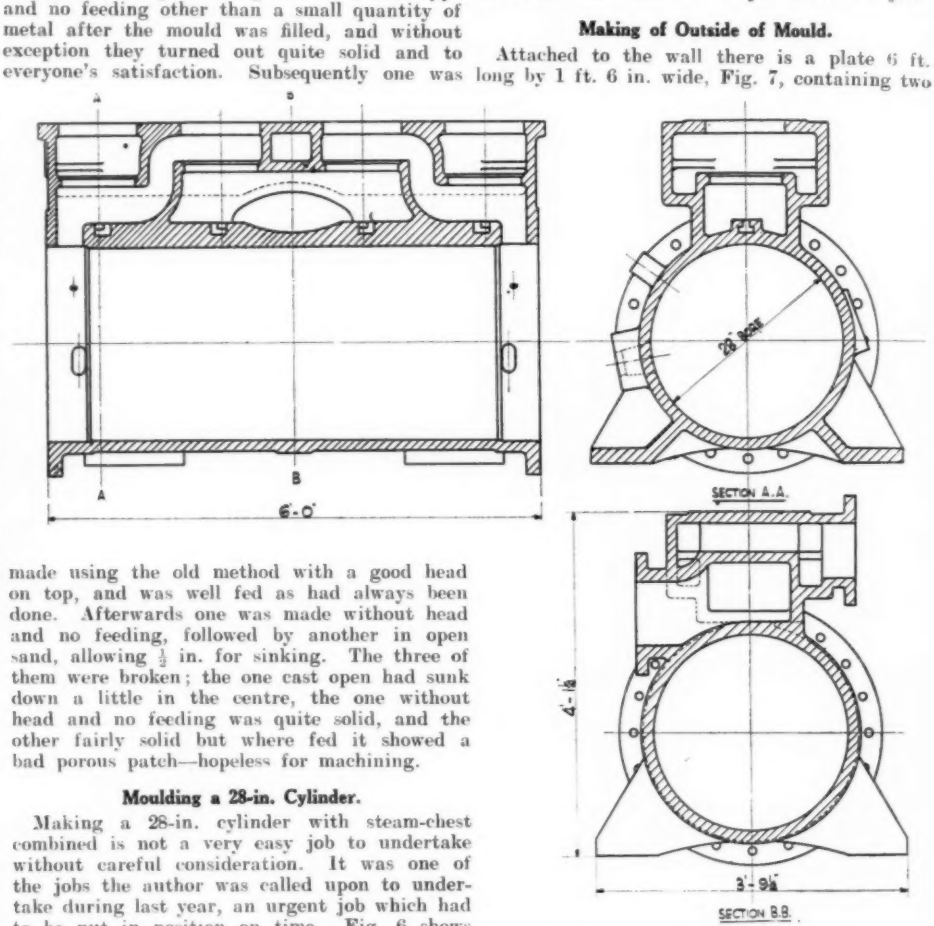


Fig. 6.—Longitudinal and Cross-sections of 28-in. Cast-iron Cylinder, showing Arrangement of Steam Ports.

"T" head slots 12 in. apart for bolt-heads; a loose cast-iron arm is attached, 3 in. sq., and made quite rigid, and plummer-block attached; a plate is then bedded in the ground with a centre pop to take the bottom of spindle. Care must be taken to see that the plummer block and plate pop are dead plumb. The whole then acts for the making of the entire job, both inside core and outside mould. The bottom plate is now placed in position for work and board attached to spindle. The first job now is the sweeping of the bottom carrying-plate so as to have it dried when preparing the bottom; it should be swept so as to leave a margin of $\frac{1}{2}$-in. loam thickness when final coat is laid on; this is then stoved for drying. The bottom plate is bricked to top of flange, which means that we brick high enough to allow a good depth of print, at least 2 in., and space for some fine coke at the bottom of the flange, which involves that there should be about 10 or 11 in. of work. Great care has to be exercised here, as this part has to bear the strain of carrying all the work in addition to the heat of the first metal dropping into the mould. When one considers the height of the cup from

the bottom, the need of care will be readily seen. The bottom should be well springed and vented, and, finally, swept with a good-quality loam, which should be mixed for the whole job. A ratio of eight parts of floor sand to one of good Southampton, mixed with one and a-half parts of good stable manure, when well ground and mixed, has proved to be an excellent material.

Now, having the bottom plate with the bottom flange, the centre print and steam-chest seating, drain-cocks and pads fixed, the bottom carrying-plate is placed in position. Of course, the flange should be taken off the board and some good green sand filled into the bottom flange to prevent the loam filling it while final coat is put on. The steam-chest pattern, with inlet and outlet branches, is placed in position and secured to prevent any knocking out of position whilst the operations are carried out. The wooden patterns used should be smeared with paraffin so as to prevent adhesion of loam. Bricking can then be proceeded with. Space should be left for securing all cores to the work when assembling, and good stiff loam should be rammed against all wood patterns. It will be observed that branches and flanges are secured to steam-chest pattern. Care should be taken in bricking around these and also around the feet, as, if they are merely a fraction out of place, trouble will be encountered when placing the assembled steam-chest in position. The best method is to make up the branches in two half-cores and place them in position when the mould is dry.

Extreme care in making up the seating for the covering plate of the steam-chest is necessary, as this, with the inlet and exhaust prints, will be the only guide for the assembled steam-chest. The feet are covered with a carrying plate which should give some bearing on the sides, and bricking proceeds up to the half-way joint; this should be evenly struck by attaching an extra board to the main board. Given a little time for setting, the moulder now places the second carrying-plate on the joint; the top half of steam-chest, with prints, etc., is attached, the strickle board being removed, the moulder proceeds to brick up to top joint, or, in the first place, to the bottom edge of top feet, which must be placed in position and great care taken to see that they are plumb with the bottom ones, otherwise trouble will be encountered from the finishing department. Drain-hole bosses, etc., are placed, and top flange, etc., are made up. This then gives the outside mould in the rough.

It has been found that a $\frac{5}{8}$-in. thickness of loam for the finishing coat is adequate for final strickling, and, when properly finished to a good surface, it will withstand anything likely to arise. The mould should now be allowed to set and harden, so that it will not become misshapen when withdrawing patterns, etc., and removing the board. The top half is now taken away, and the steam-chest half, with top feet, and drain bosses and prints are drawn out and properly dressed. When this is done, the top half is ready for stoving. The same thing applies to the bottom half, and it, too, is finally stoved. This provides accommodation for making the inside core.

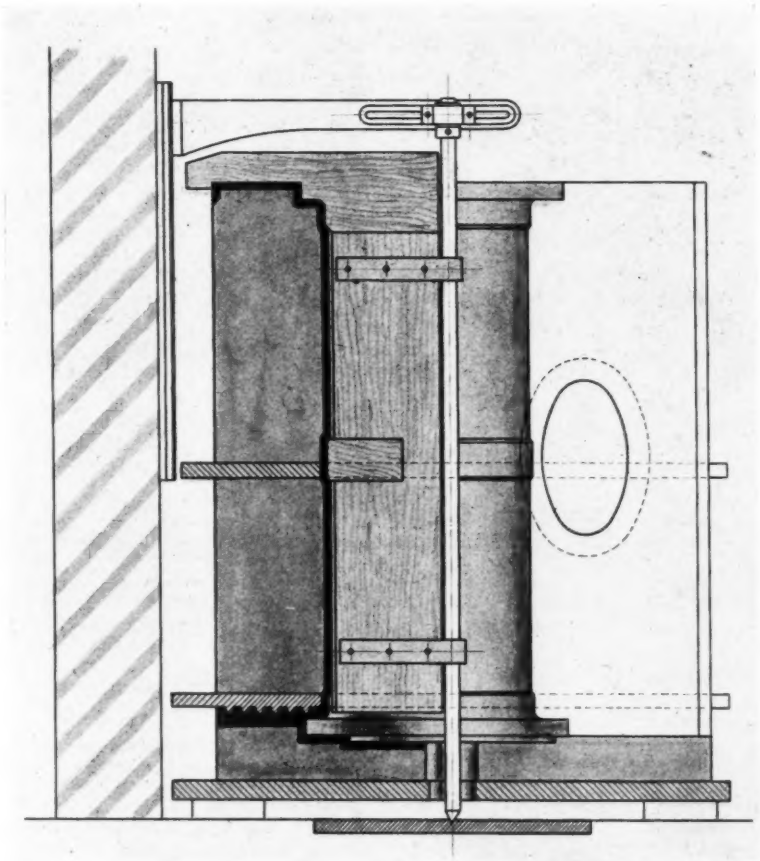


FIG. 7.—MOULD FOR 28-IN. CAST-IRON CYLINDER.

Core Making.

Fig. 8 is presented so that the method adopted to build up and carry the core into position may be better understood. The spindle is of 2-in. square iron, turned to fit the plummer block, with a square head of 1½ in. on top for the hand-wheel. The bottom is pointed to fit the centre hole in the plate. Two holes are drilled through it for bolting the two stays, and one hole at the top for carrying to position. The stays are also bolted to the bottom plate and keyed for centring. The plate should be loamed and dried before bolting to the spindle, so as to give a good level bottom for the print. The board is attached to the top bracket and bedded in the ground to ensure rigidity.

Head Ring.

Bricking commences with two or three courses of 9-in. work to produce a stiff base. It always has been found necessary to lay two sand bricks in every course to allow for contraction and easy digging after casting. After two or three courses, 4½-in. work is quite good enough up to the top, with a cast-iron ring on the top, which should be slotted to pass the spindle and clamped; this prevents the core splitting. A $\frac{5}{8}$-in. coat of loam should be allowed for finishing. The men were obliged to make the head ring (Fig. 9) with part of the inside core attached, owing to lack of headroom in the stove. One would prefer to brick the core as a single piece; it gives better accommodation for securing. The top plate is turned over and bricked up to about 22 in., allowing 4 in. of work between top of heading and top plate; the head ring should be wide enough to almost cover the top flange, and, in this case, 18 in. deep. The two plates are bolted on with six bolts each.

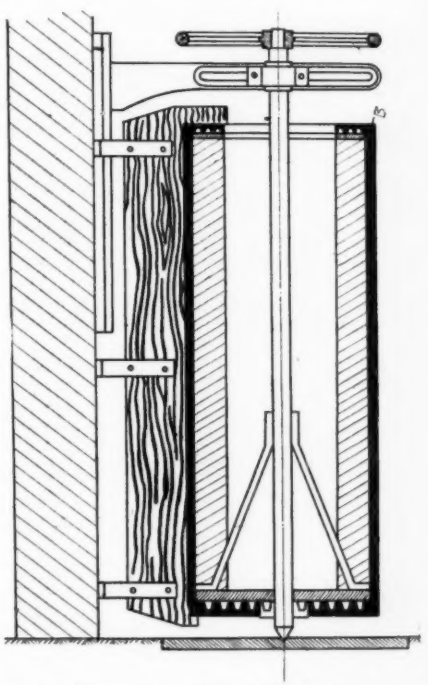


FIG. 8.—METHOD OF STRIKING CORE FOR THE 28 IN. DIA. CYLINDER.

Steam-Chest Cores.

There are four very intricate cores—the two end ones, with port cores attached; the middle one, with the out-ports and exhaust-core attached; and another core with inlet core attached, each calling for core irons of different shape.

The first item is the sand, which should be of a good mixture, as porous as possible, but strong enough to withstand hard handling. For cores of this description good floor sand, with Southampton loam and manure or fine sawdust, is preferred (20 per cent. new sand, 72 per cent. floor sand and 8 per cent. manure or 4 per cent. sawdust). Also some fine coke breeze is used wherever possible. The centre exhaust core was made in one piece, with the two-valve cores and branch core attached. The two end cores were made with the inlet ports and outer valves, and exhaust ports attached, whilst the "H" core was made with the inlet branch core in one. Space was allowed in the end core for bolting

the "H" core to them when assembling, thus giving an extra hold on both of them. This core was the most difficult one to make, and was a different proposition from the others, as one has to consider how one is to remove it after casting. It was 5 ft. 10 in. long; each side was 8 in. by 3 in., and pierced by four brackets 4 in. by 4 in. by 1 in., and the corner brackets, triangular, 4 in. by 4 in. by 1 in.; the two sides are joined by a core, 4 in. by 4 in., in the centre, with one side arched to clear the exhaust core; then the 8-in. inlet core was attached to the other side, and it is through this 8-in. core that the air of the whole core was taken away. This core iron was made with ½-in. square wrought iron welded in the centre and bent to shape; the core was made from of an oil-sand mixture of

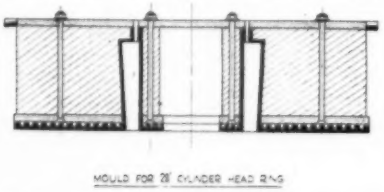


Fig. 9.—Mould for the Head Ring of the Cylinder.

three parts of sharp sand and one of loam and Spermolin oil. Although rather intricate, this turned out to be the best of the cores, and certainly the easiest to remove. All the other plates are made up and the whole dried.

The outside has now been dried and blacked, all lightening cores being fixed for the inside of feet, the bottom half with the bottom mould is placed into the pit made ready to receive it. It is necessary in the making of cylinders to resort to as few small studs or chaplets as possible, so that in assembling the mould due regard has to be paid to this, and one must, by various methods, do all one can to keep the cores, etc., in position without their use.

One can now proceed to assemble the steam-chest cores on the covering plate. The plate

Fig. 10.—28 in. dia. Cylinder in the Fettling Shop.

should be laid down so that there will be sufficient space to get underneath for bolting cores to it. The first core that should be assembled is the "H" core. There is no need to trouble a great deal about its position at the moment. It can be placed on some wooden blocks near to its thickness; then the centre core, with its valve-seats and exhaust, should be placed into its prints. This latter is the core that will present the greatest difficulty if it is not placed properly in position. It is, therefore, better to be certain that this is right initially. The little trouble experienced when placing the steam chest in position was accounted for by the great care taken with this core. The next are the end, or port, cores with the valve core attached; they should be bearing well where necessary, and all slackness around prints, etc., filled up and safely bolted to the covering plate.

The "H" core is now lifted up and bolted to the end port cores, and all bolt holes are filled and secured, all vents are cleared and properly sealed on the face and all wooden pieces removed. Care must be taken with this; each vent must have its proper outlet and be perfectly free—no metal must be allowed to get anywhere near it, otherwise the consequences will be serious. It is now placed in the stove for final drying, and, when dried, the mould is ready to receive it. It is then tilted on end and lowered into position. It was under these conditions that the only studs used were placed. The chest was inclined to tilt when in position, so that a double chaplet was placed underneath to keep it rigid. The moulder can now place the top half over the job, the joints being loamed, and the mould is then ready for the centre core, which has already been blacked. The core is carried by the hole in the top spindle, lowered into position and centred; the head-ring is placed on, the gates made up, the whole is clamped and rammed and is now ready for casting. The gate and runner used for this were of the pencil variety—in fact, the one shown in Fig. 1 was the gate for this cylinder. The quantity of metal required for this casting was 6 tons 10 cwts. The cylinder, after removing the head-ring, weighed over 4 tons 5 cwts. The usefulness of sand bricks in cores of this description shows itself when the men commence easing the cylinder. They start at the bottom and

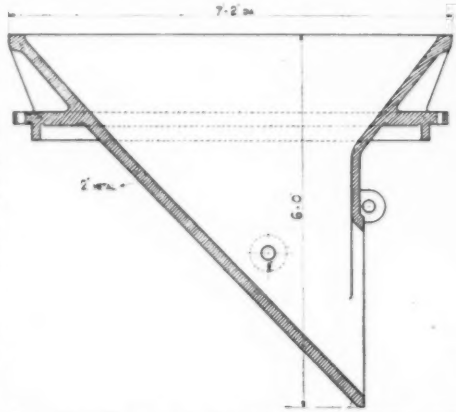


Fig. 11.—Cast-iron Charge Distributor for Blast Furnace.

work round, following the sand bricks up in their spiral shape until the top is reached. When this is satisfactorily negotiated, they can leave the casting to contract to its natural position. With the slackening of all bolts everybody may be quite satisfied. This job probably conveys a fair idea of one of the jobs the management is called upon to undertake in a hurry in jobbing foundries. This particular one turned out without a blemish of any kind, and is shown in Fig. 10.

A Cast-Iron Distributor.

This casting, Fig. 11, is used for distributing the material on top of the blast furnace and is one that requires a good deal of thought and attention. One only was required, and was to be turned out as cheaply as possible. Thus, in the making of it, the management had to take in consideration the material on hand, and try if possible to utilise it. To have made boxes for the job would have been very costly and would have run away with a large amount of the returns. It was therefore decided to make three plates and two core irons, and make the bottom in sand and the top part in loam. Therefore the bottom-half was made in a pattern, this to deliver its own core, and the bottom-outlet flange, with an addition of 4 in. for print, also to make its own core.

The top portion is 7 ft. 2 in. dia., the depth to the point 5 ft. 9⅝ in., whilst the bottom was rammed in a two-part box, the most suitable found was a pair 9 ft. by 6 ft. 9 in. by 3 ft. deep, which took the pattern up to top of the straight. Next, the first parting-plate, to carry the whole of the top work had to be found as had also the top plate, to carry the whole of the work from the bottom of the regular slope, the inside of this was of brickwork held with a ring and bolted to the top plate.

The first joint was made to allow the mould to be carried away to place the bottom-branch core into position. It will be noted in the illustration, Fig. 12, that a white mark indicates the position of the joint, carried up to the trunnions crossing the casting to the projection; this, when the box was taken away, gave room for placing the core in its print.

The top-half was made up with twenty cores, with each bracket forming the joint, and to make the top-edge of the casting, 6 in. of print was allowed for the outside of the casting, this

Fig. 12.—The Casting shown in Fig. 11 ready for Delivery.

gave the back of the cores plenty of weight to balance themselves in position. Very little trouble was experienced in assembling the mould when dried, as everything came together quite well.

The inside-bottom core was made on a specially-built-up core iron, made to suit the slope. It was rammed in the pattern after it had been delivered from the mould; the core was then turned over and dried. This is rather an awkward core to hold in position.

DISCUSSION.

In connection with gating of cylinders illustrated, Mr. McClelland asked whether the lecturer had had any experience of the gate freezing up before the mould was filled?

Mr. Southcott replied that he personally had not experienced any trouble of this sort, but had seen runners freezing up, which happened when the moulder had made the runner so small as to prevent the metal having quick access to the down gates and not sufficient head of metal above them for forcing. He was very careful as to the casting temperature of the metal, which is, after all, the most important. In connection with the scruff-gate, as illustrated, a visitor had asked whether the blind runner filled before the ring casting. It was generally found the metal would rise well up on the scruff-gate before the ring was filled, but what he wanted to convey in the illustration was that the first metal going through the down-gate carried all dirt and dust, usually found in all gates, down to the scruff-gate, where it became entrapped, and only clean metal entered the in-gate to the mould, and the shape of the inlet and the pressure behind it gave that swirling action he spoke of in the lecture.

Mr. McClelland asked whether the lecturer found that, as the metal rose in the mould, it had a tendency to gather scum and, as the mould

(*Continued on page* 148.)

The British Industries Fair.

INTRODUCTION.

Of ever-increasing importance, the Castle Bromwich section certainly warrants a visit from every foundry executive in the country. Whilst the purely foundry equipment section is still small, it is growing. But foundries require many things common to both steelworks and engineering shops, and it is specially in this direction that a visit is well worth while. Again, we estimate that from 25 to 30 per cent. of the exhibitors possess their own foundries, so that a thorough inspection should enable a foundry owner mentally to catalogue types of castings which could be incorporated in his manufactures, whilst leaving to others those unprofitable out- and under-sizes, which would admirably fit in with some other founder's production. In our review we have not attempted to describe the Stands of the actual foundries, except where, like Avery's or the Denbigh Engineering Company, their product is used by other foundries. The malleable foundries are well represented by Leys, who exhibit through Ewart's Chainbelt Company, a subsidiary, the elements of conveying systems of which they are specialists and in which the foundry industry is so interested at the moment; Hales, of Tipton and Coventry, Malleable. Of light-grey-iron casting manufacturers, there are at least fifty, and it would be easier to list the absentees than the exhibitors.

The catalogue is extremely comprehensive, and contains explanatory matter in both French and Spanish. May we suggest that the time is more than ripe for including a similar German section. Surely, the organisers possess no real excuse for its omission and many reasons for its inclusion. During the run of the Fair, there are to be visits from the Institute of British Foundrymen, the Institute of Metals and the British Cast Iron Research Association.

Foundry Equipment.

ALLDAYS & ONIONS, LIMITED, Great Western Works, Small Heath, Birmingham.

On this Stand are exhibited the main items in foundry and smithy equipment, which are made by this old-established firm, but these exhibits do not exhaust by any means the complete range of equipment made for these two important sections of the engineering and allied trades. For the foundry there is shown the furnace portion of a cupola, together with geared crane ladles suitable for iron and steel, the latter being of the bottom pouring type. A tilting crucible furnace is shown of the straight line pouring type, arranged for oil firing, but can also be supplied for gas fuel. For providing the blast for cupolas, etc., Roots blowers of several types, and also centrifugal fans of the high pressure type, are on view.

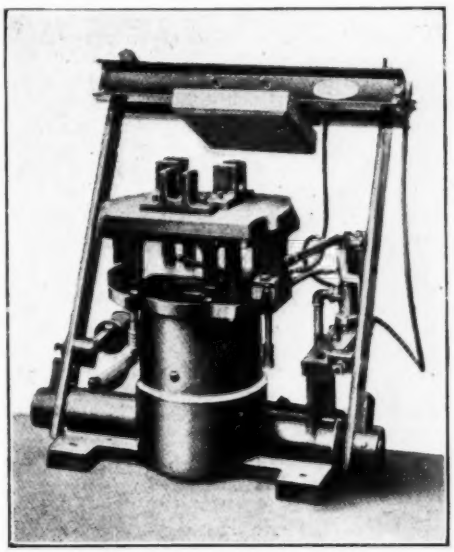
For the smithy there is a modern type of down-draft hearth, with self-contained electric blowing fan, also independent fans for supplying blast to a range of hearths. A 3-cwt. pneumatic forging hammer, arranged for belt drive, illustrates a range up to 10 cwt. capacity. A pneumatic planishing hammer is at work, suitable for panel beating, coppersmiths, etc., while riveting hammers of similar arrangement are made. Fans for mechanical boiler draft, ventilating heating, drying, etc., and also for dust collecting, are shown, these being examples of a very complete range.

Among the smaller exhibits are fans and bellows forges, and a range of small bellows of various kinds, these being the products on which the business was started over 250 years ago. This firm is in process of absorbing the Roots blower business of Samuelson's, and the power hammer business of Peter Pilkington, of Bamber Bridge.

COLEMAN FOUNDRY EQUIPMENT COMPANY, LIMITED, 1, Lancaster Place, Strand, London, W.C.2.

This firm's exhibit has four items applicable to the foundry industry. Primarily there is the "Coleman" power-squeeze split-pattern moulding machine for making moulds for small castings. It will take moulding boxes from the smallest size up to about 400 sq. in. The machine shown is of the squeezing-type, pattern-draw machine, but there are other models available which jar-ram and squeeze. The same type of machine is designed in sizes to take moulding boxes up to 3 ft. by 4 ft.

Split-pattern machines in general are particularly adapted to making moulds from symmetrical patterns that can be split through the centre or for flat-back work, but are not, however, restricted to these, as any pattern that can be split on a true plane may be moulded on it.



SPLIT-PATTERN MOULDING MACHINE, BY THE COLEMAN FOUNDRY EQUIPMENT COMPANY.

The cylinders are of large diameter, having sufficient power to squeeze the sand in flasks to the proper density by a steady pressure. Thus the loss of castings due to swelling or blowing of the moulds is reduced to a minimum.

The machine requires about 2 cub. ft. of free air at 80 lbs. pressure per mould, and a gas heater is fitted for warming the pattern plates when necessary.

The second exhibit is the "Coleman" small plain-jarring machine, suitable for any work required to be jar-rammed. This machine is typical of a large range.

The third machine shown is the "Coleman"-Prosama sand-mixing, disintegrating, aerating and throwing machine. This well-known machine will revivify sand, whilst its principal features are that it will deliver sand straight up into sand hoppers, thus acting as a conveyor, in a straight line, 25 ft. from the machine, or will sift, mix and disintegrate the sand 4 ft. from the machine, the adjustment for these various operations only taking a few minutes.

Finally, there are the "Coleman" sand-sifting machines. Two types are shown, *i.e.*, the oscillating type and vibratory type. The oscillating-sifting machine is fitted with a basket sieve, which allows the sand to flow from the sides as well as from the bottom, whilst the sand can be shovelled into the basket from any point.

CONSTRUCTIONAL ENGINEERING COMPANY, LIMITED, Titan Works, Charles Henry Street, Birmingham.

This well-known foundry-equipment firm is exhibiting a bottom section of a 4 ft. 6 in. dia. "Poumay" cupola having a melting capacity when lined of 6 to 7 tons per hour. Under the Poumay system the coke consumption is guaranteed, and for ordinary grey-iron castings the fusion coke figure is as low as 6½ per cent. of weight of metallic charge. The additional advantages of the Poumay system are stated to be cleaner metal, reduction in daubing costs, reduction of sulphur content, and hot metal. Over 450 cupolas are now working under the Poumay system.

The bottom section of 3 ft. 6 in. "Titan" cupola, embodying all the latest improvements, is also shown. This cupola would have a melting capacity of 4 tons of metal per hour when lined down to standard diameter. By the side of these there is a "Titan" cupolette, a small complete melting plant popular for use with grey and malleable iron, and particularly suitable for special mixtures, emergency castings, etc. Over 1,200 of these plants are now in use in foundries, engineering shops, etc., throughout the world.

Other foundry exhibits include a range of "Titan" pressed-steel ladles; a self-contained core stove of special design, suitable for coal, coke, or gas firing; the "Titan" mechanical riddle, arranged for belt or electric drive, taking ½ h.p., and the "Titan" rumbler. This machine is built to comply with the latest Home Office requirements with hollow trunnion for dust extraction.

Finally there is "Titanite," the pattern-plate material. Specimen double-sided and single-sided pattern-plates and oddsides are shown through the kindness of users of "Titanite." From some of these pattern-plates 7,000 to 10,000 moulds have already been made; one foundry alone has now used over 65 tons of "Titanite."

DENBIGH ENGINEERING COMPANY, LIMITED, Horseley Heath, Tipton, Staffs.

The Denbigh Marvel moulding machine is the principal exhibit on this Stand. This machine it will be remembered is the only hand jar-ramming machine on the market. Being portable, it lends itself in a very special way to continuous moulding, with a minimum expenditure on auxiliary plant. Mould carrying is eliminated, and if the sand is dressed before or after the day's work, a system can be evolved which will produce castings at a remarkably low figure.

PNEULEC, LIMITED, Mafeking Road, Smethwick, Nr. Birmingham.

Pneulec, Limited, have made two important additions to their foundry equipment manufactures since the 1929 Fair, and these are now demonstrated for the first time.

The one machine is a high-speed electric swing-frame grinder, and is a development of the earlier Pneulec machine. This new machine is produced to meet the requirements of those firms envisaging to high speed grinding, and is probably the only machine which has the wheel rotating at right angles to the frame of the machine itself, and which is not belt operated. These are important features, the advantages being (1) the fettler has a much better sight of his job, and (2) the machine is easier and more flexible to handle. The machine is accurately balanced, with the weight distributed so that the fettler is able to make full use of this during grinding without exertion. The drive is supplied by a 5 h.p. totally-enclosed motor, and the starting gear is of the robust design necessary for foundry use. The main shaft is carried in two sets of double row self-aligning ball bearings of ample size, and the roller chain which drives the main shaft is running in an oil bath. These factors, together with absence of

belt stretch and slip, ensure smooth running, and an important feature of the machine is its rigidity and absence of vibration on the control handles. The motor housing, and all other castings except the oil-bath chain case (which is aluminium) are in cast steel, and altogether it is a well-designed and constructed job, contributing its quota to the general speeding-up in production.

The second addition to the Pneulec line is on the moulding machine side, and the machine demonstrated is of the jar rollover pattern-draw type. There are features about this machine such as the way in which the shock is taken when the table plate falls, and the method employed in rolling over and drawing the pattern, which will appeal instantly to every foundryman.

On a Pneulec machine the impact is not made by the table striking on a small area just around the top of the cylinder, and contrary to most machines the cylinder takes no shock at all. The table and base are so designed that the shock is evenly distributed all over, and this is arranged in the following way. On the bottom of the table plate there are a number of machines bosses, and in the base at corresponding points are machined pockets, in which are fitted hard rubber pads covered by steel discs. When the table plate falls impact is made over a big area, and there is the same density of jar over the whole of the pattern table. The blow is dead solid, and is entirely free from spring or rebound. The rubber pads ensure resiliency and prevent metallic shock on the box. Additional to the bosses on the jarring table there are in each of the four corners machined

Portable Grinder, by Pneulec, Limited.

guides, which fit accurately with machined adjustable wearing plates in the base. These guides are pressure-grease-lubricated, and their purpose is to relieve the cylinder and plunger of the balancing function. They keep the table absolutely square during the jarring operation, and there can be no wobble or getting off centre. This method of construction gives guide and support at five points instead of one, and is a feature to be found only in the Pneulec machine. Due to the fact that the force of impact is distributed over the whole area of the table plate, it is possible to use a much lighter section plate than the heavily ribbed plate which is ordinarily used. This naturally makes the machine more economical to operate, and gives the Pneulec machine an increased jarring capacity of 20 to 40 per cent. per cylinder-inch.

The rollover portion is an entirely separate machine, and where a plain jarring machine has been installed the rollover can be added at any subsequent date without in any way interfering with the foundations of the jarring machine. The features of the rollover and pattern-draw attachment are its positive and smooth action. These operations are hydro-pneumatically controlled. The pattern-draw cylinder is equipped for fast and slow draw, and the automatic self equalising device on top of the cylinder ensures that the box leaves the pattern absolutely square.

In addition to the foregoing there are also Pneulec-Royer sand-mixing machines to be seen in operation. There are several minor improvements in the construction of this machine over that exhibited at the 1929 Fair, but the main principle of operation which has proved so satisfactory remains the same.

Raw Materials.

MASTABAR BELT FASTENER COMPANY, 14a, Blackfriars Street, Manchester.

In addition to the "Mastabar" patent belt-lacing tools, "Mastabar" belt squaring and cutting tools, together with the requisite accessories, a new feature, that of rawhide pins, suitable for all kinds of hinged belt-fasteners, is being shown.

MONEL-WEIR, LIMITED, Cathcart, Glasgow.

The Stand of Monel-Weir, Limited, is a striking epitome of the range and diversity of applications of Monel metal and pure malleable nickel. The feature of these materials is their combination of toughness and strength, ornamental appearance and resistance to corrosion. In consequence, they are used for such widely different purposes as steam valves and hearth furniture, chemical plant and dairy equipment, shop fronts and dyeing machinery.

A new alloy is also being shown, marketed under the name "Nickel-Chromium-Iron." This alloy is resistant to nitric acid and the mixed acids used in nitration processes, and may be described as a super stainless steel, in that it combines the advantages of the earlier stainless steels with definitely enhanced corrosion resistance and considerably greater ease of fabrication.

"Nimol," a new cast-iron alloy, containing about 20 per cent. Monel metal, possesses pronounced resistance to heat oxidation up to 600 deg C., and is free from the destructive growth which characterises normal cast iron. It is essentially a cast material, and is offered as such only.

T. J. PRIESTMAN, Cupro Foundry, Leopold Street, Birmingham.

This old-established concern show a very complete range of non-ferrous alloys made up suitable for remelting in the foundry or working the rolling-mills forges or extension works.

Refractories.

GENERAL REFRACTORIES, LIMITED, Wicker Arches, Sheffield.

This Stand is unique from the fact that it takes the form of a small model of an actual round down-draft kiln, complete with chimney. A special feature shown is "Insulite" insulating bricks, and the Stand actually shows a layer of "Insulite" bricks in the kiln wall. Another special feature of the exhibits is "Pyrolite" cement, which is a high-temperature cement which will withstand any industrial furnace heat. In addition there are displays of British sands for all classes of foundry work, firebricks, magnesite bricks, chrome bricks, silica bricks, and all other types of refractory bricks for furnaces and other purposes.

TIMMIS & COMPANY, LIMITED, Stourbridge.

This concern is showing an interesting range of bricks, with a very high grog-content. It has long been known that a high percentage of grog (previously calcined fireclay) very largely increases the resistance of the brick both to chemical action and thermal shock. Messrs. Timmis & Company, Limited, have carried this to its logical conclusions, and are supplying bricks made entirely out of grog. This is an exceptionally interesting exhibit, in that it forms a unique class of refractory, which differs in its physical properties as widely from the ordinary fireclay brick as the ordinary fireclay brick does from silica.

Electric Furnaces.

BIRMINGHAM ELECTRIC FURNACES, LIMITED, 55, George Street, Parade, Birmingham.

A full-scale half section of a large "Birlec" furnace, which illustrates the robust method of construction and the special patented heating element employed is included in the exhibits of the above firm. Owing to its size it is impossible to show a furnace of this type in operation at an exhibition. Photographs of some large installations are, however, shown, including furnaces for annealing and general heat treatment of steel and non-ferrous metals, bright annealing, carburising, hardening, etc. All these installations are in commercial operation, and full particulars including operating costs are available.

One illustration on the Stand shows a large box type "Birlec" furnace having a usable hearth 9 ft. long by 5 ft. wide and a maximum rating of approx. 180 kw. arranged for mechanical charging and used for carburising. A "Birlec" electrically-driven charging-machine is shown in the foreground of the picture.

Two standard portable "Birlec" furnaces of an entirely new range are also shown, both being in operation. The smaller one—model HC.P.2—which has a hearth 30 in. long by 15 in. wide and a maximum rating of approx. 18 kw., is shown re-heating steel parts previous to oil quenching, and the larger model—H.C.P.4.A.—which has a hearth 3 ft. long by 23 in. wide and a maximum rating of approx. 30 kw., is shown carburising. Whilst both models are similar in outward appearance to those shown by this firm at the British Industries Fair last year, the outstanding difference of this new series (which is in addition to and does not supplant the previous series) is in the design of the heating elements which is now similar to that employed with success in their larger installations. The system (which is patented) consists of supporting the resistor, which is of heavy nickel-chromium strip bent into zig-zag form on heavy gauge hooks of the same metal. In this way there is no contact between the element and the refractory, and all risks of "hot spots" due to masking or of any inter-action between the element and the lining are entirely eliminated, with a consequent considerable increase of resistor life. The supports are placed at such frequent intervals that with the heavy gauge of strip employed no sagging or distortion of the elements can take place.

The furnace itself consists of a welded steel cylinder—a shape which cannot be easily distorted or damaged—lined with special shaped refractory and insulating material. Except for the hearth, which is flat, the interior is also circular. This construction allows free interchange of heat by radiation, ensuring even heating, and in addition tends to focus the heat on the centre of the charge so that there is no tendency for the sides of the charge to be heated more rapidly than the middle.

The heat insulation consists of Sil-o-Cel, varying in thickness between 4½ in. and 9 in., according to the size and purpose of the furnace. The makers' patented parallel motion, well-insulated, socketed door, giving easy operation and tight-closing without clamping is employed. It is lined with refractory and insulation, the latter being covered with nickel-chromium sheet. A switch is operated by the door so that the act of opening shuts off all current from the furnace. This switch like the other electrical connections is safely housed away from the operator in the back of the furnace.

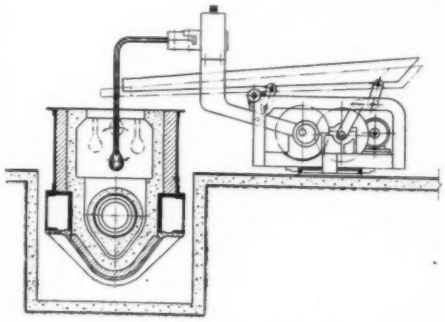
All parts of the refractory which are subjected to abrasion, such as the hearth and edges of the door opening, are protected with nickel-chromium, the hearth being entirely covered with heavy cast nickel-chromium plates, the side elements being well protected with cast nickel-chromium guards. Automatic tempera-

ture control, which is designed to maintain any desired temperature up to 1,000 deg. C., is fitted to all models, as standard, and several different types are exhibited.

ELECTRIC FURNACE COMPANY, 17, Victoria Street, London, S.W.1.

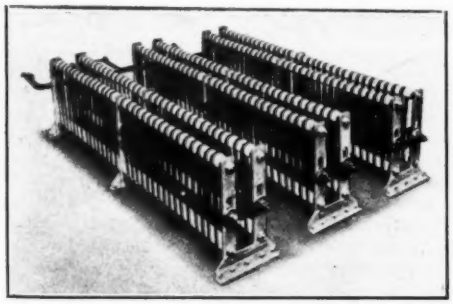
This company and its newly-formed subsidiary company, the Electric Resistance Company, Limited, have staged a joint exhibit.

The Electric Furnace Company deals with electric-melting furnaces of all types, such as the Héroult arc furnace, the Ajax-Wyatt induction furnace, the Ajax-Northrup high-frequency furnace, etc. The types of furnace which they construct are generally of far too large a size for it to be possible to show them in operation at an exhibition, and consequently their principal furnaces are shown by means of photographs of installations, drawings, etc. They are exhibiting, however, in operation a small



Charging and Poking Machine for Ajax-Wyatt Furnace melting Swarf, by the Electric Furnace Company.

Ajax-Northrup high-frequency furnace. This unit is suitable for use in laboratories and also illustrates the principle of high-frequency melting, which has now been developed to such an extent that furnaces of a capacity of 1 ton of steel per hour are in operation and furnaces up to 5 tons capacity have been designed. They are also exhibiting a new type of poking machine, which is used for stirring brass swarf in Ajax-Wyatt furnaces. This machine greatly reduces labour costs, reduces the power consumption, and increases the number of heats produced in a given time by over 20 per cent. Drawings and photographs are shown of installations of Héroult, Ajax-Wyatt and Ajax-Northrup furnaces.



Electric Furnace Core-Stem Heaters, by the Electric Furnace Company.

The Electric Resistance Furnace Company, Limited, also normally supplies plant too large to be shown at an exhibition, though full-sized demonstration furnaces of various types can be seen at their works at 360, Farm Street, Birmingham. They are exhibiting a melting-pot heated by electric resistors, which is suitable for aluminium, lead, and other metals of low melting-point. The pot shown has a capacity of about 200 lbs. of aluminium. These pots can be made in sizes varying from 20 lbs. up to 5 tons.

They are also exhibiting an air-heater, suitable for supplying hot air for drying purposes of all kinds, such as moulds, cores, etc. The heater shown is of very simple construction and of 3.4-kw. rating. This company are also exhibiting photographs and drawings of pottery kilns, large slab-heating furnace, annealing furnaces, continuous strip furnace, and a tube-annealing furnace.

A number of electric-furnace products are also being shown, including intricate castings of steel made in an Ajax-Northrup high-frequency furnace, pottery decorated in an "Efco" kiln, etc.

GENERAL ELECTRIC COMPANY, LIMITED, Magnet House, Kingsway, London, W.C.2.

Of main interest to metallurgists is the range of electric furnaces shown by the G.E.C. Primarily there is a standard Magnet-type electric furnace actually annealing brass stampings, spinnings, etc. Two other electric furnaces also are shown, a muffle furnace and a high-temperature steel-hardening furnace—the former serving to preheat high-speed steel tools before they go into the hardening furnace.

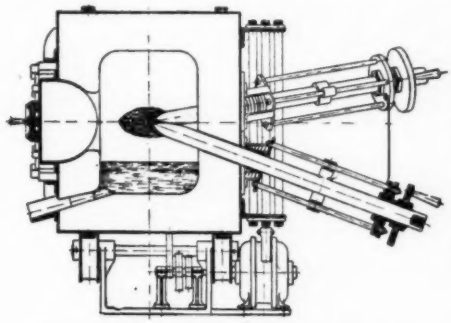
Another Magnet-type electric furnace, designed for annealing steel and case-hardening steel, is shown in operation. Adjacent to this is a lead melting-pot in operation, an electric still and an electric cyanide-pot.

There is also shown a sectional model of the Grunewald electric bright-annealing plant for steel and copper strip and wire in coils—samples which have been bright annealed are displayed on the stand.

WATSONS (METALLURGISTS), LIMITED, Lancaster Street, Neepsend, Sheffield.

The plant being shown on this Stand is "The Watson Rotating Furnace" for non-ferrous metal melting. As the name implies, it is a furnace of the rotating type, and is designed to employ single-, two- or three-phase current, and is classed as an indirect arc-type of furnace, that is, the electrodes are independently of the metal, the metal being heated by radiation and also by contact with the lining which has absorbed heat by radiation from the arcs.

The rotation of the furnace, in addition to



Rotary Electric Furnace, by Watson (Metallurgists), Limited.

thoroughly mixing the metal and thus ensuring a homogeneous product, also enables the metal to extract the heat absorbed by the refractory lining on account of the metal constantly coming in contact with almost the whole of the lining during each revolution of the furnace. This action prevents the lining attaining any great degree of superheat and consequent destruction, as well as reducing the radiation of the furnace to a minimum.

In addition to the above, there are photographs of the "Greaves-Etchells" electric furnaces for steel melting, and also a variety of ferrous and non-ferrous alloys which the firm supplies to the various Sheffield trades.

Furnaces other than Electric.

BRITISH FURNACES, LIMITED, Chesterfield.

An exhibit of interest to firms melting tin, lead, type-metal and other soft metals is a small gas-fired melting furnace fitted with natural-draft burner and having a pot capacity of 300 lbs. of lead.

A high-speed steel furnace for tool-hardening at temperatures up to 1,350 deg. C. in the lower chamber and 875 deg. C. in the upper one is shown in operation.

A gas-fired crucible furnace for brass- and copper-melting and suitable for accommodating a 40-lb. (copper) crucible is also in operation on this Stand.

Various gas and oil burners, venturi mixers and other gas-burning appliances are shown, together with a number of photographs and coloured drawings of large furnaces for normalising, annealing and carburising.

The company are makers and builders of furnaces for practically every industry where heat is required in the manufacturing processes. Modern industrial requirements are so varied that it is not possible to enumerate them all, but we give below a list of the more important industries for which they cater.

Furnaces for the shaping and forming of iron and steel for the heat-treatment of special steels, melting of all classes of non-ferrous metals, furnaces and baths for surface-treatment of metals, foundry core-drying ovens, furnaces for varnish-boiling, kilns, glue-heating, boiler-firing, and baking ovens, refractory testing furnaces. The company also supply assay plants for the evaluation of coal for carbonising purposes, for which they supply a complete plant, including washers, purifiers and holder.

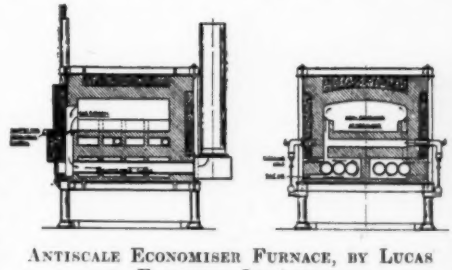
The company have recently installed two patent continuous belt-conveyor furnaces for heat-treating driving-chain links, which are the first of this type to be put down in this country. They are also now developing a gas-fired regenerative furnace.

BRITISH REVERBERATORY FURNACES, LIMITED, 88, Kingsway, London, W.C.2.

The Sklenar Midget oil-fired furnace for melting copper, bronze, brass, and other all alloys is being shown under heat on this Stand. This furnace is unique in character, as it retains all the good points of an open-hearth furnace, whilst its small capacity (300 lbs. copper) allows of the elasticity to be associated with the crucible. This tiny furnace has a regenerative system built into it, and is hand-tilted. The larger sizes, ranging up to 2-ton copper capacity, are, of course, motor-tilted. This Stand should certainly be inspected by all non-ferrous founders.

LUCAS FURNACES, LIMITED, 53, Broad Street, Birmingham.

This firm are showing two small furnaces. The first, which is working, is a Lucas patent gas-fired furnace on natural draft suitable for tem-



Antiscale Economiser Furnace, by Lucas Furnaces, Limited.

peratures up to 1,050 deg. C. It is fitted with a metal recuperator for utilising the waste heat to preheat the secondary air necessary for intensifying combustion, and a gas screen at the front to prevent air entering the chamber when

the door is open. The internal dimensions of working chamber are 12 in. wide × 18 in. deep × 9 in. high to the crown of arch. It is specially insulated and built in a patent tubular casing with lifting counter-balanced door. A second furnace similar to the above, but arranged for oil-firing, however, is not shown under working conditions.

Many recent installations are illustrated by means of photographs.

THE INCANDESCENT HEAT COMPANY, LIMITED, Cornwall Road, Smethwick, Birmingham.

A novel and interesting feature shown on this Stand is a patent combination reversible recuperative and regenerative furnace. For high-temperature operations such as billet-heating for forging, drop-stamping, firing of refractories and pottery-ware, the furnace gives excellent results, and in addition can be operated as a continuous recuperator without reversing for the maintaining of dead-even temperatures over long periods, such as are required for carburising, close annealing, etc. All temperatures up to and including 1,500 deg. C. can be readily attained and maintained within very critical limits. Reducing, oxidising or neutral atmospheric conditions are stated to be obtained at will. The furnace is robust in construction, and meets the requirements of practically every industry. The furnace exhibited is fired by means of town gas, but is equally suitable for washed or crude producer-gas.

A second exhibit is the patent incandescent super natural-draft gas-fired furnace. This introduces a new system of recuperation as applied to natural-draft town-gas-fired industrial furnaces. Each gas inlet and combustion port is fed by an independent bank of recuperator tubes, so arranged that the maximum heat from the waste gases is delivered to the air required for combustion. Both recuperation and insulation are incorporated to their respective practical and economical limits. This furnace has a temperature range from 500 to 1,100 deg. C., and a high thermal efficiency is obtained. The furnace can be seen in operation fitted complete with electric automatic temperature-control gear and pyrometric equipment.

A further exhibit of special interest is a new type of liquid-hardening furnace which can be arranged for gas-firing with either natural-draft or air-blast, and is also equally suitable for oil-firing. Some of the main features of this furnace include top-heating, large storage capacity, rational gas flow without direct flame-impingement on the container.

A full range of photographs and drawings are available of the most up-to-date heat-treatment and quenching machines, conveyor-type normalising plants, automatic bright annealing machines for ferrous and non-ferrous metals, continuous billet-heating and rolling-mill furnaces and air-heating equipment, so that the requirements of all industries and every furnace-user is catered for.

The exhibits also include examples of porcelain enamelling on cast iron and sheet steel which have been carried out by incandescent patent enamelling equipment and with "Pemco" enamels.

Fettling and Finishing.

W. CANNING & COMPANY, LIMITED, Great Hampton Street, Birmingham.

This Stand is of more than usual interest, owing to the great advance which has taken place during the past year in the perfecting and extension of chrome-plating. As for quality of results, an interesting collection of chrome-plated articles will be shown having relation to hardware, house-fittings and sundry examples of work in special lines.

A warm nickel vat, complete with rotary air-pump, for agitating and filtering the warm nickel solutions and oval depassive anodes, is being shown.

In the polishing and metal-finishing department considerable advance has been made, of which full details will be available. Automatic machines for polishing have been designed which show a considerable reduction in production costs.

In addition, examples of plating barrels, a lacquer-spraying cabinet and a large collection of plating, polishing and finishing materials are included, embracing chemicals, compositions, brushes, wheels, bobs, felts, mops and bronzing and lacquering supplies.

DAVIDSON & COMPANY, LIMITED, Belfast.

Anyone interested in ventilation should visit this Stand, where opportunity is afforded of seeing one of the well-known air-washers made by this firm in operation. Apart from its ability to cleanse thoroughly the air supply in connection with ventilation schemes, this washer also plays an important rôle in Sirocco air-conditioning plants, in which relative-humidity and temperature-control are important factors. The firm specialises in dust-removal installations of every description, and an excellent example of their work of this nature is exemplified by a small plant applied to two double-ended grinders, the dust being very effectively caught by well-designed hoods and extracted from the air-current by a Sirocco collector. Finally, a working model of the "Davidson" patent flue-dust collector is available for inspection, and a very representative range of "Sirocco" fans suitable for cupola-blowing and for all purposes for which a fan can be employed.

F. GILMAN (B.S.T.), LIMITED, 221, High Street, Smethwick, Staffs.

This firm is exhibiting a very full range of scaling tools, including machines for fettling and trimming castings, for tank-cleaning purposes, as well as for rust- and paint-removing and other similar work.

An entirely new type of machine, shown for the first time, comprises an electrical plant operated off the ordinary electric supply circuit by merely plugging into the electric-light fitting. Power is carried to the machine through a length of cable. The motor is ½ h.p. and is mounted in a swivel bracket, allowing both lateral as well as vertical movement. The motor is mounted about 3 ft. 6 in. from the ground on a pedestal fitted with castor-wheels. Halfway up the pedestal there is a circular tray which is provided for carrying the various working heads when not in use. The drive from the motor is by means of flexible shafting such as is provided with practically all "Skatoskalo" tools, in which type of drive this company have a very wide experience. The flexible shafting runs in a steel-reinforced rubber outer covering. Various working heads can be attached to the flexible drive in a very simple way, and the machine will carry out such work as drilling (in the most inaccessible positions) all types of grinding work with emery-wheels. It can be also used for sanding car-bodies before painting or cellulosing, as well as for polishing and finishing-off the paint or cellulose after it has been applied. Special sanding and rubbing-down pads are provided for this work. Similar heads, but of cone-shape, can be provided for getting into positions where the flat sanding-heads cannot be applied. Wire brushes are also used with this machine for cleaning inside the mudguards, along the footboards, and for working into other awkward positions.

The machine can be provided with wire brushes for decarbonising, and can further be used in conjunction with rotary rasps for repairing tyres, for rasping out cuts and bad patches prior to vulcanising. It will be seen that this plant finds not one, but very many uses in the garage and motor trades, as well as in pattern and fettling shops.

L. N. MILLS & COMPANY, LIMITED, Archdale Works, Notting Hill, London, W.11.

A full and comprehensive exhibit of all classes of wire brushes suitable for the foundry trade is contained on this Stand.

TILGHMAN'S PATENT SAND BLAST COMPANY, LIMITED, Broadheath, Nr. Manchester.

This firm are showing a 5 ft. dia. rotary-table sand-blast machine of new design, the particular features being the jet-swinging arrangement that allows the whole surface of the table to be evenly covered by the blast-jets, the movements varying in speed equal to the square of the diameter of the table, whilst all gearing and other working parts are enclosed in a perfectly protected and dust-proof casing running in oil. A sand-blast apparatus shown working in conjunction with this table is also of new design. It is suitable for a pressure of 30 lbs. per sq. in., but can be built for pressures up to 80 lbs. per sq. in. The dust and abrasive are completely separated in an enclosed dust-proof circuit. The whole operation of separation is automatic and does not allow the escape of any dust into the surrounding atmosphere, whilst the degree of separation and disposal can be controlled at will. The feed of the abrasive to the pressure chamber operates automatically, being controlled by the quantity of material passing, obviating the necessity of stopping the machine whilst the abrasive is dropped into the pressure chamber.

A sand-blast chamber for hand-operation provided with rotating table to facilitate the handling of the work is also shown. This apparatus works in conjunction with a variable blast apparatus suitable for a pressure of 80 lbs. per sq. in. This exhibit is provided with a sand-separating appliance similar to that already described, but without the automatic feed for the abrasive to the pressure chamber.

A sand-blast tumbling barrel shown is provided with rubber-covered rollers to prevent wear of barrel-supporting paths, and collecting hopper arranged to swing open to facilitate the discharge of finished work. The nozzles in this barrel operate through the ends of the barrel. The apparatus to work this barrel is of standard type and suitable for a pressure of 25 to 30 lbs. per sq. in.

A second sand-blast barrel for small articles is also exhibited. This is a self-contained unit for low pressure (25 to 30 lbs.), and to operate this requires a compressed-air supply of 90 cub. ft. free air per min. An exhauster is also required to remove the dust.

A sand-blast chamber designed for cleaning small articles is shown in operation on the stand.

A self-contained air-washer for fixing between sand-blast apparatus, and an exhauster in which the dust-laden air passes through the surface of water and is deposited in the base in the form of mud, and a series of air compressors, complete an exhibit of outstanding interest for the foundry community.

Pattern Shop.

THE DOMINION MACHINERY COMPANY, LIMITED, Hipperholme, Halifax.

Since they last exhibited at this Fair this firm have moved into newly-erected and well-equipped premises. They are showing numerous pattern-making machines. A new-type Super-Elliot woodworker, a machine that will rip, cross-cut, trench, bore, surface, thickness, tenon, mitre, chamfer, etc., is shown at work. The machine is now fitted with separate ripping spindle with iron table, improved rise and fall motion to the table and spindle, and with a surfacer and thicknesser ranging from 16 in. to 24 in. x 9 in. The machines are self-contained with motor and electrical equipment.

The Dominion 30-in. band-saw with integral drive is being exhibited for the first time.

as are also new 20-in. and 26-in. saw-benches with recent improvements, and the Dominion chain and chisel mortisers, surfacers and thicknessers, sanders, spindle moulders, etc.

The popularity of this firm's combination machine, the Super-Elliot woodworker, is amply verified by the fact that over 2,000 machines of the older type and the new type are in use in Great Britain alone.

THE MACO TEMPLATE AND ENGINEERING COMPANY, LIMITED, 19, Cursitor Street, London, E.C.4.

This firm are showing the Maco template, which consists of a number of hard-drawn brass laminations 0.007 in. thick held together by two clamps. The clamps when unlocked will allow the laminæ to slide between two aluminium retaining plates, but by means of corrugated rubber faces effectively prevent the laminations from falling out. The template, being made of aluminium and brass, is rustless and very robust. In use the locking screws are loosened and the template gently pressed against the contour required. The laminæ will take up the contour of this surface, and owing to their thinness this shape will be extremely accurate. The template is then locked and a perfect copy of the original contour is obtained. Other, and permanent, templates may be made from this, or the contour may be transferred to a recording frame by means of a pencil. This recording frame is constructed of aluminium, and is shaped to hold the Maco template together with the card on which to record the contour. Profile perfectors are hard, wooden instruments which are used after the approximate setting of the template by hand to obtain a sharply defined contour. The template should prove useful in a number of trades besides the metal-working industry; for example, cabinetmaking and joinery, patternmaking and general foundry purposes.

Auxiliary Equipment.

AEROGRAPH COMPANY, LIMITED, 43, Holborn Viaduct, London, E.C.1.

This exhibit includes a working plant, with which practical demonstrations of the Aerograph spray-finishing system are being given, whilst new types of portable painting plants are shown. Also there are being shown an entirely new low-pressure spray gun and a novel automatic paint regulator.

ATLAS PRESERVATIVE COMPANY, LIMITED, Deptford, London.

This firm's exhibit is one of particular interest to those concerned with the economic upkeep of plant, buildings and equipment constructed of iron and steel or timber. Their Stand is given over largely to the display of mechanical and other scale models of typical structures treated with "Atlas Ruskilla" iron and steel preservative paint. It is claimed that this material, by reason of the special medium employed in it, will stand up to conditions which would render ordinary paints too short-lived to prove profitable. It grips the metal tenaciously, forming a tough covering which throughout its long life stubbornly resists the attacks of acid and alkali fumes, steam, moisture, and exposure to the weather. And this would seem to be borne out by the fact that it is extensively employed in foundries, chemical works, mines, and in other spheres where adequate protection from corrosion is essential but difficult to obtain. "Ruskilla" is elastic, and consequently does not chip or crack, but expands and contracts with the metal. It is made in black, white, and a range of attractive colours, all of which have a good covering power and superior finish.

An exhibit which will attract the attention of those resident overseas relates to a product known as "Atlas A" wood preservative. This includes a number of timbers used in a test conducted by the Vernacular Forest School, Balaghat. These timbers were placed side by side in a termite (white ant) hill for 15 months. The untreated specimens show plainly the ravages of the insects, while the "Atlas"-treated pieces are undamaged. This material renders timber immune from the attacks of any kind of insect, and arrests and prevents "dry" and "wet" rot, fungi, etc. It hardens and toughens the wood-fibre, and renders the timber extremely fire-resistive. It is simple to use, and extremely economical. Its claims are substantiated by various reports on tests conducted by official and eminent bodies.

The Atlas Preservative Company have agents in the principal commercial centres throughout the world, and do an extensive export trade.

BRITISH OXYGEN COMPANY, Angel Road, Upper Edmonton, London, N.18.

This firm are in the happy position of showing oxygen cutting machines designed to help the founder by reducing scrap into suitable sizes for re-melting, and burners for welding up defective castings so as to make them saleable, or plant calculated to put him out of business, as they show "a machine-tool which will enable them (manufacturers) to produce as desired any required shape from steel plates up to a thickness of 15 in., thus eliminating the disadvantages of forged and cast parts," to quote their own description of their oxygen cutting plant.

Founders should examine carefully the potentialities of these machines, from the dual aspect we have outlined.

DONOVAN & COMPANY, 47, Cornwall Street, Birmingham.

This exhibit comprises ironclad switchboards, open-type switchboards, Home-Office fuse and distribution boards, D.C. starters, regulators, fan-regulators, and dimming switches, Home Office wall sockets and plugs, etc. A new type of isolating link is being shown for the first time. This isolating link is of novel design and construction, and provides a very rapid means of isolation combined with a contact of negligible resistance. These links are particularly suitable for the isolation of motor control gear, transformers, etc., under Home Office Rule No. 11, and can also be used as a quick, cheap and efficient means of jointing cables.

W. T. NICHOLSON & CLIPPER COMPANY, LIMITED, "Clipper" Works, King Street, Salford, Manchester.

The improved "Klincha" belt-lacing machine shown on this Stand embodies many improvements, and the principal features of which are as follow: Detachable magazine facilitating the insertion of the hooks into the machine when making the joint, and improvements enabling the machine to be operated with one hand, leaving the other free to hold the belt in the correct position while the joint is being made. It should be mentioned that the "Klincha" belt fasteners are now mounted on an outside paper strip and made up in 12-in. lengths, preventing any lateral displacements and making it easier and quicker to place the fasteners in the machine.

The improved "Klincha" vice tool is specially suitable for small users of belting. It is a 4-in. machine, intended for use on an ordinary vice. The well-known 3-in., 4-in. and 6-in. "Klincha" mellet tools are now made for use with the improved types of fasteners.

The "Python" file and tool handle and the improved "Klincha" belt-cutters are also on the Stand.

H. C. SLINGSBY, 89, Kingsway, London, W.C.2.

On this Stand are ladders, barrows and trucks of endless shape, size and variety—1,900 are made and catalogued, and we are sure that if any foundry owner needed a special type of truck or barrow, Mr. Slingsby would not be averse to making 1,901 models. The electrically-operated trucks, of which five models are shown, present features of real interest to our readers.

THE "RAPID" MAGNETTING MACHINE COMPANY, LIMITED, Magnet Works, Lombard Street, Birmingham.

The exhibit comprises five various examples of magnetic-drum and pulley-type separators, two types of shute separators, a representative magnetic clutch, two types, electro-lifting magnets on gantry with hoist blocks and a spring cable drum, a foundry sand-separating and sieving plant, and sundry small magnetic apparatus. A number of the exhibits are shown at work. Of the exhibits of particular interest to foundries we would draw attention to the following:—For non-ferrous foundries there is a complete high-intensity rotary drum "Standard" type separating machine at work handling metal swarf. It is suitable for treating mixed metal swarf and granular materials containing considerable percentage of iron. A fixed inside half-circle magnetic unit is surrounded by a revolving brass drum, on which a jig-shaken tray feeds the material from a hopper with the feed regulation. The drum is 14 in. dia. A plant popular with modern ironfoundries is a drum representing the larger and more robust high-intensity "AA"-type machine, the drum being steel cased and 24 in. dia. Its most-highly developed form is shown by an electric-motor-driven plant. This plant combines a hopper-fed short-conveyor-type magnetic-pulley separator, with a mechanically jig-shaken sieve, removing the iron from the foundry sand and sifting out all oversize and foreign materials, rendering it fit for re-use. Several designs and sizes of plant are standardised, of capacities from 1 ton per hour to 10 tons per hour or more.

For the larger iron and steel foundries the exhibits of electro-lifting magnetics are of particular interest. Three types are shown:—(1) Circular magnet, standardised in numerous sizes from 6 in. dia. to 76 in. dia., and exhibited in 26 in. dia. actually lifting loads. They are suitable for suspension from a crane hook for lifting loose pig-iron, light and heavy scrap, skull-cracker ball, heavy ingots, etc.; (2) bi-polar magnet shown in operation and for lifting channels, girders, angles, bars, long ingots, etc., and (3) rectangular magnet for plates, etc. These are standardised in numerous sizes, 16 in. wide and 20 in. to 70 in. long. All these magnets can be arranged to work in pairs on a suitable spreader beam for lifting long articles which would otherwise sag. Suitable magnet controllers, arranged on patent potentiometer system, are provided.

THE SOLDO COMPANY, Sicilian House, Southampton Row, London, W.C.1.

This firm are demonstrating the properties of Soldo patent tinning compound, which is a combination of non-acid fluxes and metal, and under the influence of heat and Soldo alone, all metals, ferrous and non-ferrous, except aluminium and low-grade cast iron, whether rusty, corroded, greasy or oily, with no previous preparation whatsoever, can be permanently and effectively tinned. A complete description of this was given in connection with the last Foundry Exhibition.

The tinning of rusty and corroded metals, and also the tinning of metals hitherto impossible or difficult to effectively tin, such as cast iron, Manganin, Staybrite, steel, high-tensile nickel chrome steel, Stalloy, Stellite, blue planished steel, galvanised iron, etc., is being demonstrated on the Stand, and the reprint of the National Physical Laboratory Report is also shown.

THE UNITED STEEL COMPANIES, 17, Westbourne Road, Sheffield.

Four firms, constituent companies of the parent concern, have combined to make a most interesting collection of metallurgical products. These firms—Samuel Fox & Company; Daniel Doncaster; Steel, Peech & Tozer, and United Strip & Bar Mills, have all contributed their quota, but it was the stainless material which

interested us the most. Apparently they have catered for every industry but that of the foundry, and we suggest that some standard lines of brads, gaggers, lifters and the like would be worth consideration. Not merely would they be almost everlasting, but the handling by the moulder of bright material would have a psychological effect tending to pride in his work. Some standard chills, too, would make for better workmanship from the foundry, as blowing from cracks would be eliminated.

Research Service and Testing.

W. & T. AVERY, LIMITED, Soho Foundry, Birmingham.

As is usual, this Stand is one of the most attractive in the Exhibition, and, whilst not catering specially on this occasion for the heavy industries, they do show automatic weighers for bulk material. Testing machines, for which the firm is justly famous, are also shown, whilst a specific-gravity machine is a real novelty and should be inspected by every reader. We would take this opportunity of congratulating the firm on achieving its 200th anniversary. Is it, we wonder, the oldest foundry in Great Britain?

CAMBRIDGE INSTRUMENT COMPANY, LIMITED, 45, Grosvenor Place, London, S.W.1. Birmingham Office and Repair Depot, MESSRS. ASTBURY & SMITH, Empire House, Great Charles Street, Birmingham.

This well-known firm is exhibiting a representative collection of instruments for engineering and industrial purposes, including electrical CO_2 indicators and recorders, apparatus for recording the percentage of dissolved oxygen for boiler-feed water, draft- and pressure-gauges, temperature-measuring instruments, and other instruments for engineering and electrical measurements.

There are several electrical instruments for gas analysis which contain no chemical absorbents or fragile glasswork. The apparatus is extremely robust and needs little attention, while the time-lag is negligible compared with that usually associated with apparatus of the chemical-absorption type. The outfits shown include a 4-point combined indicating and recording CO_2 outfit, and a 2-point CO_2 and CO indicator. Mention should be made of the latest form of combined CO_2 meter and aspirator, which has been recently re-designed. The CO_2 meter is now combined together with a water-bubbler and aspirator to form a complete all-metal metering unit, which gives accurate readings in widely varying boiler-house conditions, and is exceptionally robust and dependable.

The exhibit of draft- and pressure-gauges includes dial-gauges with dials 7 in. and 13 in. in dia. for draft or pressure up to 20 in. of water, and pressure-recorders for ranges up to 2,000 lbs. per sq. in. These latter instruments, which have been supplied to foundries for many years for the measurement of high pressures, are now made in low-pressure models of various standard ranges from 0 to 4 in. of water up to 0 to 2 lbs. per sq. in., draft or pressure.

A combined pressure and temperature recorder also exhibited combines the mechanism of a pressure-recorder with a mercury-in-steel thermograph, and may be used for steam, liquids or gases. It is fitted with two pens which record side by side on one chart, one pen being arranged to record the pressure, while the other is moved in accordance with fluctuations in the temperature as measured by a mercury-in-steel bulb. The bulb is connected to the recorder by flexible capillary tubing which may be any length up to 50 in. The instrument can be used for temperatures between −40 and + 540 deg. C. and for pressures or vacua between − 15 and + 2,000 lbs. per sq. in. It is calibrated to cover only the working range, thus ensuring an open scale. The charts are 9½ in. dia. A similar instrument is also shown, arranged to give simultaneous records of the pressures at two different points, on the one chart.

A number of the well-known Cambridge mercury-in-glass thermometers for pipes, flue gases, etc., are shown. These thermometers have clear scales, are well protected against accidental damage, and are extremely accurate, well-finished examples of this popular form of thermometer.

Various patterns of indicating thermometers with dials 8 in. and 13 in. in dia. are shown, and recording thermometers with charts 9½ in. in dia. Owing to their accuracy and their robust construction these instruments are largely used in foundry processes involving the measurement of temperature. One of the recording thermometers shown is fitted with an improved design of case which gives added robustness, the new case being exactly similar in appearance to the Cambridge pressure recorders. Another recording thermometer is shown enclosed in a substantial watertight and fume-proof case suitable for use where the conditions are exceptionally severe. Among the indicating thermometers is an instrument fitted with a circuit-breaker controlled by an adjustable pointer moving over a secondary dial, enabling the instrument to be used as an automatic temperature-regulator.

The electrical distance-thermometers shown enable the temperatures in all parts of a foundry to be accurately observed on a single instrument, which can be placed in the most convenient position at any distance from the core- or mould-drying stoves.

Thermo-electric pyrometers are the type most generally used in the foundry industry for measuring temperatures up to 1,400 deg. C. The exhibit includes a standard thread recorder giving three records on one chart, the galvanometer mechanism being totally enclosed within a robust metal case, and a "Model B" recorder for single-point recording outfits. In this Model B recorder the design has been simplified by limiting its application to temperatures which can be measured with base-metal thermo-couples (up to 1,200 deg. C.), and by making it only as a single-point instrument. Apart from these limitations the instrument possesses the essential features of standard Cambridge thread recorders.

A new recording potentiometer has been designed to give continuous, accurate records of small variations in electromotive force. It may be employed, for example, to record temperatures, voltages, electric currents, power and A.C. frequency, humidity, hydrogen ion concentration, the calorific value of gases, and various constituents in gas analysis. The recording potentiometer can also be used for the automatic control of these conditions, and may be arranged to operate alarm signals, *e.g.*, coloured lights, electric bells, or a klaxon horn, if the electromotive force being measured should vary from any predetermined value. When used as a temperature-recorder the potentiometer has the advantage that a set-up range can be readily obtained, so that an openly-divided chart covering only the working range of temperature is used. The instrument exhibited is arranged to record temperatures up to 1,000 deg. C.

For continuous temperatures above 1,250 deg. C. it is necessary to employ an instrument which depends for its operation upon the heat radiated from the hot body. The Féry radiation pyrometer, which is of this type, is suitable for measuring temperatures of hot furnaces, rolling-mills, pouring-temperatures of molten metals, etc. A portable outfit is exhibited, comprising a telescope (which is sighted upon the hot body) mounted upon a tripod stand, and connected by a short length of leads to a portable indicator, from which the temperature is read.

The Cambridge optical pyrometer shown is a portable and accurate instrument for measuring the highest temperatures met with in industry, its range of measurement being from 700 deg. C. to 4,000 deg. C. The instrument may be regarded as a photometer, in which, by simply rotating the eyepiece, a beam of monochromatic light from the hot body is adjusted to be of the same intensity as a beam of light from a standard incandescent lamp; attached to the eyepiece is a pointer which indicates the temperature directly upon a clearly-divided scale.

The disappearing-filament pyrometer, also exhibited, is a simple, portable and inexpensive instrument, for use where the high accuracy of the Cambridge optical pyrometer is not required. It is capable of measuring temperatures up to 2,100 deg. C. The instrument comprises an electric lamp, a small ammeter and a rheostat. The current through the lamp is adjusted until the top of the filament is of the same brightness as the hot body, and disappears when viewed against it. The temperature is then read on the ammeter scale.

MOND NICKEL COMPANY (Bureau of Information on Nickel), Imperial Chemical House, Millbank, London, S.W.1.

This exhibit includes samples illustrating the various applications of nickel and its alloys, of which the following are of special interest to the foundry and allied industries. Nickel cast iron will be represented by a petrol-pressure casting, a casting in which a sound dense iron is essential, showing the uniformity obtained in both thin and thick sections. The non-ferrous alloys will include castings in Monel metal, nickel silver, nickel-chromium heat-resisting alloys, including small machined parts to show the machining qualities of this group of alloys, nickel-bronze and Y-alloy. Technical literature is available and representatives are in attendance to give information and discuss any problems concerning the use of nickel and its alloys.

THE RESEARCH AND TRAINING SECTION OF THE GAS LIGHT AND COKE COMPANY, Watson House, London, and the CITY OF BIRMINGHAM GAS DEPARTMENT, Industrial Research Laboratories.

This exhibit includes a selection of apparatus such as is employed in connection with the testing of materials, fittings and appliances used by gas undertakings, foundries and engineering establishments. The exhibits include a 10-ton single-lever testing machine of the vertical type, electrically-driven and arranged for tensile, compression or bending tests. Actual testing will be carried out on this machine, and, as in previous years, free certificates will be issued to other exhibitors in connection with tests carried out on materials which are exhibited at the Fair.

A Brinell hardness-testing machine, of the dead-weight type, will also be demonstrated, together with a new type of sheet-metal testing machine.

Other exhibits include methods of testing corrosion by means of gaseous or atmospheric type of apparatus. The microscopic examination of metals will also be demonstrated, and the method of testing oils will form part of the exhibit. On another section of this Stand will be demonstrated the method of measuring the radiation from a gas fire, and also the methods by which gas fittings are tested will be shown fully under practical conditions.

VIOZONE, LIMITED, 88, Chancery Lane, London, W.C.2.

On this Stand a new development is being shown—the "Pyroversum II," a precision pyrometer, which is an improvement on the "Pyroversum I." Whereas the original Pyroversum has only a range from 500 to 1,400 deg. C., the new improvement covers accurate readings 900 to 2,000 deg. C. Before the introduction of this pyrometer it was not possible to read furnace temperatures above 1,400 deg. C. by a purely optical instrument, but extensive research work with British material and British labour has produced the "Pyroversum II." This instrument consists of a calibrated metal frame with a shaded glass in the centre, graduated from

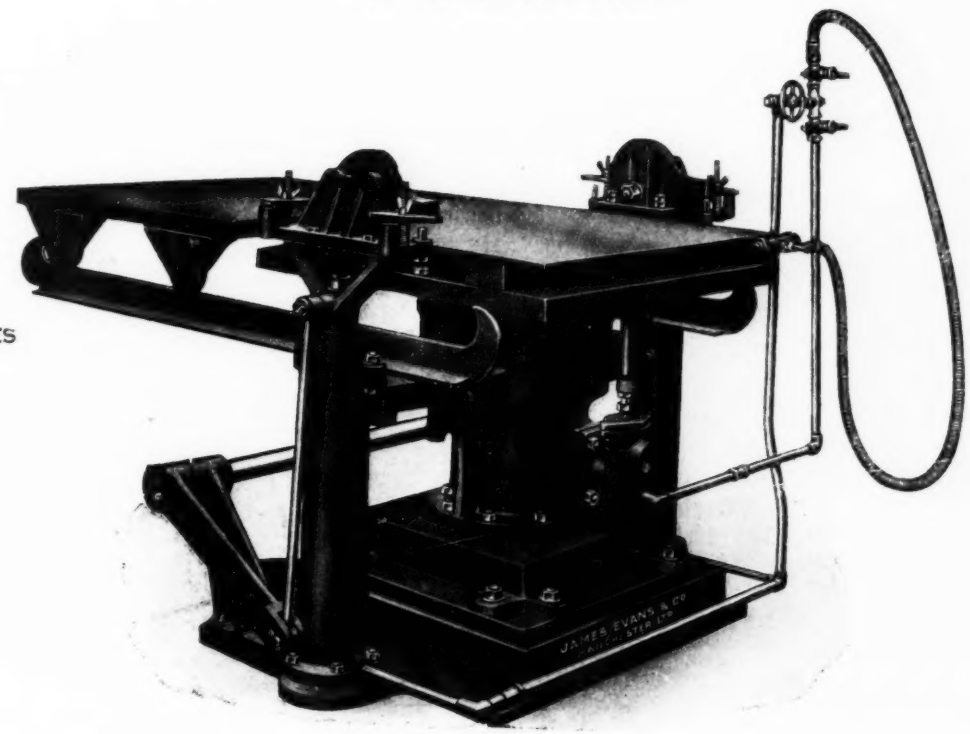
TYPE "C"

JAR RAM MOULDING MACHINE

with Turnover Pattern Plate.

For Pneumatic Power.

TWO MACHINES IN ONE.



UNSKILLED LABOUR ONLY REQUIRED.

The above machine illustrates a Jar Ram Machine with Turnover Pattern Plate which can also be used for Stripping Plate Work.

The machine has been designed to combine the two distinct features above mentioned, and is practically two machines in one, equally suitable for steel, iron, etc.

The machine as illustrated is arranged for work that requires turning over, such as steel moulding. And while the turnover arrangements are intended for general repetition work, by detaching the turnover plate from the trunnion brackets the machine can be used for stripping plate work by attaching the stripping plate to the trunnion brackets. Or, on the other hand, by removing the trunnion brackets as well, the table can be used for jolting general jobbing work.

A very important feature of the machine is the simplicity with which the intensity of the Jolt can be regulated when the operator has become accustomed to the use of the machine, which takes but an hour or so. The valves all being on the exterior of the machine are easily accessible, and there is an adjustable arrangement that will allow the jolt to be varied between 1½ in. to below ½ in. This being done without disturbing any part of the machine.

The machine is supplied with Withdrawal Carriage, Vibrator, and Blow-off Nozzle complete. It is substantially constructed to stand heavy wear and tear, and requires a minimum amount of skill to operate.

Another important feature of the machine is in the arrangement of the hard wood anvil block for receiving the shock. The blocks being carried well down the machine in a specially designed annular chamber give considerable relief to the foundations. It also provides against the possibility of fracturing the jolting table. Pitch pine blocks are also inserted between the foundation plate and the machine bedplate to assist in the relief on the foundations, and these features considerably improve the working advantages of the machine.

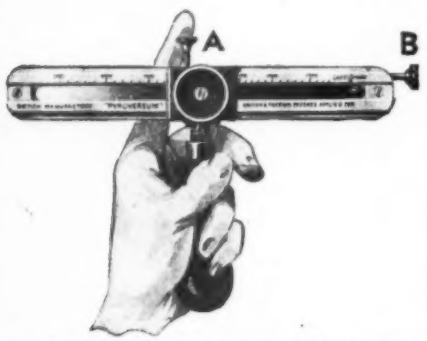
IT IS ALSO ENTIRELY OF BRITISH DESIGN AND MANUFACTURE.

JAMES EVANS & CO. (M/c) LTD.

Britannia Works, BLACKFRIARS, MANCHESTER.

reddish opaque to a dense opaque. A worm spindle for fine adjustment, extended from end to end at the back of the frame, and operated by a thumb screw, ensures accurate and steady readings of all temperatures. The Pyroversum is not only a useful instrument for ordinary temperature readings, but useful for checking up electrical pyrometers and ascertaining correct temperatures of pouring metal at the mouth of the cupola or other furnace.

The furnace or heated metal is sighted through a hole in a slide piece, by pushing the slide gradually to the right until the glow of the furnace or heated metal is no more visible. The



The "Pyroversum" Precision Pyrometer.

reading of the temperature is indicated by the scale on the left-hand side of the slide piece.

This new invention, which is being shown for the first time, will meet the need of every foundry using furnaces, etc., at a very moderate cost.

Conveyors.

HERBERT MORRIS, LIMITED, Loughborough.

It is outside the buildings that this well-known firm of lifting- and conveying-tackle manufacturers show a petrol-electric jib crane of five tons capacity. From an examination it appealed to us as being a useful piece of plant for foundry-stock yards.

W. & C. PANTIN, 147, Upper Thames Street, London, E.C.4.

This concern is exhibiting an installation of conveyors consisting of an inclined drag-type elevator for raising boxes, gravity roller-conveyor for conveying them, and a patent inclined belt lowerator for lowering them, and also a machine for wire-tying boxes.

Prime Movers.

BROOM & WADE, LIMITED, High Wycombe.

The outstanding exhibit on this Stand is the firm's latest petrol-engine-driven lightweight portable compressor plant, actually delivering 100 cub. ft. of free air per minute, suitable for 100 lbs. per sq. in. working pressure, and capable of operating 5 long-stroke riveting hammers. This machine consists of a new design of a single sleeve-valve type 2-cylinder 5-in. × 4½-in. compressor having a piston displacement of 116 cub. ft. per minute and actually delivering 100 cub. ft. of free air per minute at 1,200 r.p.m., this being direct-coupled to a 6-cylinder engine developing 28 h.p. at this speed. Standard equipment includes generator, sprung axles and rubber-tyred wheels, also complete steel housing with detachable sides and locking device.

The unique feature of the plant is that the engine is fitted with electrically-operated hand-starting equipment. The weight of the plant complete does not exceed 25 cwts.

PETTERS, LIMITED, Yeovil.

This exhibit caters in the main for those interested in oil engines. The machines shown range from a few up to 195 h.p. This is a 3-cylinder automatic Diesel cold-starting, airless-injection heavy-oil engine. Of main interest to our readers is a 1½-h.p. air compressor, comprising a Reavell compressor direct coupled to a Petter 1½-h.p. Hopper-cooled magneto ignition engine, which is shown in operation.

Transport.

R. A. LISTER & COMPANY, LIMITED, Dursley, Glos.

On this Stand there is a representative exhibit of their manufactures, including Lister auto-trucks, light-plants, pumps, and a range of petrol-engines.

Four Lister auto-trucks—the Sweeper, Rail, Elevating and Universal-Tipping models—are shown, all of which are of the latest design. This includes a new type of roller-steering, by which means clogging by dirt and grit of the power unit in its frame is avoided, thus greatly facilitating steering. Spring pillars and spring saddles are fitted except in certain cases. The rail truck is the latest 30-cwt. model, fitted with improved buffers, three coupling heights and special adhesion weights. The elevating model is fitted with stabilisers at each side, and platforms can be obtained in widths varying between 20 in and 40 in. The universal-tipping model is fitted with improved tipping mechanism and with 17-in. wheels. The elevating model shown on the stand is also fitted with the Fire Office Committee equipment. This equipment is fitted to trucks working in surroundings where special precautions have to be taken against the risk of fire. The equipment consists of a fire extinguisher, flame-arrestors on the carburettor, special bolts on the fuel tanks to prevent accidental spilling, a special fish-tail, and an oil-catching tray bolted under the engine.

Specialties.

BEECROFT & PARTNERS, LIMITED, Retort Works, Mappin Street, Sheffield.

The main appeal of this Stand is to the foundry trade, and the exhibits are, for the most part, specialities for this industry, such as core binders, fluxes, plumbagoes, parting powders, silica flour and terra flakes.

The core binders shown include the following brands:—Corbeerite, Greenbond, fluid and solid, Sandoil, and an entirely new product marketed under the name of Corbeerite double-bond. This material, it is stated, is capable of being used with any class of sand and is also economical in use.

The fluxes shown include:—Puric cupola flux, Puric flux for brass and bronze, iron-ladle flux, brass flux and aluminium flux. These fluxes have been evolved with a view to assisting in the cleansing and purification of metals during the melting process prior to casting, and so producing clean, sound and homogeneous castings.

As one branch of this firm's business is devoted to analysis and physical testing of all classes of metals, alloys and materials used in their production, *i.e.*, coals, cokes, refractories, oils and waters, etc., a portion of this Stand is devoted to the detailing of these facts. As manufacturers of certain laboratory products they show Carbest combustion boats, tubes and absorbtion bulbs, and pocket microscopes.

The railway companies are building more all-steel passenger coaches. Apart from the Underground lines, there are now 500 of them running on the railways of Great Britain, the London Midland & Scottish Company having 435.

Recent Clyde Launches.

Messrs. Scotts' Shipbuilding & Engineering Company, Limited, Greenock, have launched from their Cartsburn Dockyard the twin-screw motorship "Clytoneus," which is the 78th vessel built for Messrs. Holt & Company, Limited, Liverpool, by Messrs. Scotts. The "Clytoneus" is 6,400 tons gross, 426 ft. 6 in. on waterline, 56 ft. breadth and 31 ft. 9 in. depth. The constructional material is special elastic steel, and the propelling machinery is a departure from any specialised type built to Messrs. Holt's specified requirements in collaboration with the North-Eastern Marine Engineering Company, Limited, and Messrs. Scotts. There are two sets of six-cylinder four-stroke single-acting engines arranged to work with Buchi turbo superchargers. All auxiliary machinery is electrically driven.

Messrs. Barclay, Curle & Company, Limited, have launched from their West Yard at Scotstoun the single-screw steamer "City of Barcelona" for the Ellerman Lines, Limited, gross tonnage 5,600 and a deadweight capacity of 9,500 tons. The propelling machinery, constructed at the North British Engine Works, consists of a main engine of the steam reciprocating four-crank triple-expansion type fitted with Beardmore Caprotti valve gear and designed for a working pressure of 265 lbs., with 150 deg. superheat.

Messrs. D. & W. Henderson, Limited, Partick, launched the steel screw cargo steamer "Baron Napier," which has been built to the order of Messrs. H. Hogarth & Sons, Glasgow. The vessel is of the single-deck type, with poop, bridge and forecastle rigged as a two-masted schooner. The machinery is being supplied by the builders and consists of triple-expansion engines working at 210 lbs. steam pressure.

Messrs. Workman Clark (1928), Limited, Belfast, have launched the twin-screw motorship "Lossiebank," built to the order of Messrs. Andrew Weir & Company, Limited, for their Bank Line services. This is the second of four motorships which the builders have under construction for the same owners. The vessel has a length of 440 ft., beam 57 ft. and depth 38 ft. 7 in. The machinery, constructed by the builders, consists of a twin set of Sulzer-type engines, each having five cylinders.

Messrs. John Lewis & Sons, Limited, Aberdeen, have launched the "Loch Torridon," built for the Loch Line Trawling & Fishing Company, Limited. The "Loch Torridon" is the largest trawler yet built for Scottish owners, and is 150 ft. in length and fitted with triple-expansion engines having cylinders 13 in. by 23 in. by 36 in., with 26 in. stroke.

The Caledon Shipbuilding & Engineering Company, Limited, Dundee, have launched the motor liner "Talisse" from their Stannergate Yard. The launch took place about three o'clock, but owing to a strong south-westerly wind blowing when the vessel took the water, instead of being carried up the Tay, she was blown downstream. The vessel was not made fast at the Eastern Wharf until nearly 10.30 p.m.

Sheffield University Old Students' Association.

The London Branch of the Sheffield University Old Students' Association has arranged for a reunion dinner to be held at Stewarts' Restaurant, Victoria, London, S.W.1, on March 15. As there are a large number of our readers who are old students of the metallurgical department living in the London area, yet not in touch with the Association, we have been asked by the honorary secretary, Mr. G. Rush, 55, Limedale Gardens, Edgware, Middlesex, to bring this function to their notice.

This is a page of the Foundry Data issued gratis by the B. A. Co., Ltd.

Aluminium Data Sheet A128

ALUMINIUM-COPPER-ZINC ALLOYS

While a straightforward mixture of aluminium and zinc has good mechanical properties, is excellent for machining, and above all, is cheap, it is unfortunately 'hot short' or weak at high temperature. This causes difficulty in founding and in consequence simple aluminium zinc alloys are now rarely used.

The addition of a small percentage of copper greatly reduces the 'hot shortness' and has no adverse effect upon the mechanical properties or the machinability, and alloys of this nature are extremely popular for castings of all kinds.

The standard British alloy of this composition is that known as 2 L 5, which contains 12·5% to 14·5% zinc, 2·5% to 3% copper, and the remainder aluminium. This alloy is very extensively employed in Great Britain for gear-boxes, crankcases and even for parts subjected to high stress. Zinc-bearing alloys do not maintain their strength at high temperatures and should not therefore be used for pistons and similar parts.

The properties specified for a chill cast test bar in 2 L 5 alloy are 11 tons per sq. in. tensile strength and 3% elongation. These are minimum figures, but the average of a large number of tests shows following results may be expected:

	Sp. Gr.	Elastic Limit Tons/sq. in.	Ultimate Strength Tons/sq. in.	% Elong. in 2"
Chill Cast	2·99	6-8	11-16	3-10
Sand Cast	2·99	4·5-6	9-12	2- 4

Where high ductility is particularly desir may be attained with the sacrifice of amount of tensile strength by reducing content to, say, 8%, maintaining the copper content at 3%. Such an alloy, in the chill cast form, may have a tensile strength of 9 to 10 tons/sq. in. with a percentage elongation of 10% to 13% on 2 in.

F.T.J. 21-2-30.

70% of the aluminium castings made throughout the world are made in one of two alloys. One of these is an aluminium-copper-zinc alloy.

Aluminium
THE BRITISH ALUMINIUM CO., LTD.
ALUMINIUM PRODUCERS. ADELAIDE HOUSE, KING WILLIAM STREET, LONDON. E.C.4.

GANISTER, CUPOLA BLOCKS, FIRE BRICKS,
FIRE CLAY.
Silica Bricks, Tuyeres, Stoppers, Nozzles, &c.
STEEL MOULDERS' COMPOSITION, SILICA CEMENT.

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"TEAM" PATENT COKE
SPECIAL FOUNDRY QUALITY

FOR PRICE AND PARTICULARS APPLY TO:—
ALEXANDER LEITH & CO.,
25, COLLINGWOOD STREET,
NEWCASTLE-ON-TYNE.

TYPICAL ANALYSIS (if necessary guaranteed).

ASH	not exceeding	8%
SULPHUR	,, ,,	0·8%
VOLATILE	,, ,,	1 %
MOISTURE	under	1·50%

Trade Talk.

The business of the Wigan Rolling Mills Company, Limited, Wigan, is being offered for sale outright.

The Government Steel Works at Yawata, Japan, have decided to roll sheet piling. The imports of sheet piling have risen considerably during the last four years.

The British Shareholders' Trust is to underwrite an issue of 272,000 £1 ordinary shares at 30s. in the Birmingham Railway Carriage & Wagon Company, Limited.

The Liverpool office of the British Thomson-Houston Company, Limited, has been moved from 16, South Castle Street, to new premises at 27-29, Stanley Street, Liverpool.

The partnership between Messrs. E. C. Wood and Thomas Jenkins, carrying on business as engineers and metal founders, at Barry, under the style of the Wood Jenkins Foundry Company, has been dissolved. Mr. E. C. Wood is continuing the business.

The partnership between Messrs. John Ballardie and F. P. Acklin, carrying on business as metal merchants, at Clyde Works, Collingwood Street, Liverpool, under the style of Ballardie, Holden & Company, has been dissolved. Mr. John Ballardie is continuing the business.

Messrs. Jukes & Company, 61, Merchants' Exchange, Cardiff, have been appointed agents in Cardiff and Monmouthshire districts for Messrs. R. Y. Pickering & Company, Limited, Wishaw, Lanarkshire, manufacturers of railway carriages and wagons, wheels and axles, colliery tubs, etc.

A cable from New Delhi states that Sir George Rainy's Steel Protection Amendment Bill was introduced in the Legislative Assembly recently. The Bill brings all steel bars and rods over $\frac{7}{16}$ in. dia. under protective duty. There is to be also the same duty on tie bars for cast-iron sleepers, as on spikes. Both changes are for the purposes of combating evasion of the protection scheme.

An order for fifty 40-ton bogie plate wagons has been placed by the London & North-Eastern Railway Company with Messrs. Head, Wrightson & Company, Limited, Thornaby-on-Tees. Fifty wagons of the same type, in addition to twenty-five 50-ton wagons, have been ordered by the L.N.E.R. from the Metropolitan-Cammell Carriage, Wagon & Finance Company, Limited, Birmingham.

Since the decision of the English Steel Corporation, Limited, to close their works at Penistone was made known, several inquiries, it is stated, have been made with regard to the purchase of the works as a going concern or for their conversion to some other industry. Mr. J. H. Thomas, the Lord Privy Seal, has received a deputation from the Penistone Urban District Council with regard to the closing of the works.

The Ailsa Shipbuilding Company, Limited, Troon and Ayr, have received an order from the General Steam Navigation Company, Limited, London, to build a single-screw steamer for the Continental trade. The vessel will have a deadweight capacity of 1,600 tons, and provision will be made for pre-cooling fruit cargoes and for carrying fruit and chilled or frozen meat simultaneously. Triple-expansion engines will be supplied by the builders.

Public attention has recently been called to the lack of a Museum of Engineering Industries of the North-East Coast. A movement has now been started to discover whether such a museum can be founded. Representations have been made to the Council of the North-East Coast Institution of Engineers and Shipbuilders, and it has in consequence been decided to lay the facts before the Lord Mayor of Newcastle-upon-Tyne, and submit the suggestion that a committee representative of all branches of the engineering industry on the North-East Coast be convened and deputed by the Lord Mayor to review the position.

Speaking at a dinner of the Swansea Technical College Metallurgical Society, Dr. P. M. McVair, of the Grovesend Steel & Tinplate Company, Limited, said that the policy of buying foreign steel was a very short-sighted one. A flourishing tinplate trade in South Wales could not be established if foreign steel was taken in. If anything happened to the home steel industry the tinplate trade would go down. The elimination of the South Wales steelworks would place the tinplate markets into the hands of the foreigner. It could not be denied that at present the dumping of foreign steel helped to produce a cheaper tinplate, but what was going to happen in the future must cause them very deep consideration.

Speaking at a Chamber of Commerce meeting in Edinburgh, Mr. John Craig, chairman of Messrs. David Colville & Son, Limited, Motherwell, paid a tribute to the men in the iron and steel industries for nobly facing reduced wages in an effort to get a trade revival. Rationalisation was not a food, he said; it was simply a medicine. It simply meant fitting their production to their powers of consumption. It seemed almost a crime to talk of profits in the heavy industries. He would welcome the admission by statesmen that they might without disrespect to themselves as a nation make some reference to industry being allowed to earn a profit. Rationalisation could only be regarded as a palliative by covering up the inability of statesmen to see far enough ahead and the error of economists in thrusting a financial policy upon the country without due reference to its effect upon industry.

Included in recent orders received by the British Thomson-Houston Company, Limited, Rugby, for electrical plant destined for duty overseas is one from the High Commissioner for India for four water-wheel driven alternator sets to be used in the Shanan Power Station in connection with the Uhl River hydro-electric scheme. Each alternator will be driven by a Boving water-wheel, and will have an output of 12,000 kw. For the supply of electric power to the mines of North Broken Hill, Limited, Broken Hill, South, Limited, and the Zinc Corporation, Limited, Australia, a central power station is projected, and orders have been received by the British Thomson-Houston Company, Limited, for the six 2,500-k.v.a. alternators and the whole of the switchgear. In addition, the British Thomson-Houston Company has received orders for outdoor-type transformers required in connection with the electrification scheme. Of these transformers, seven are three-phase units each of 750 k.v.a., and eleven are single-phase units of 833 k.v.a. rating.

The 5½ per cent. first mortgage debenture holders of the Carnforth Hematite Iron Company (1915), Limited, have received a circular from the trustees, Imperial and Foreign Corporation, Limited, recalling that in July, 1927, they passed certain resolutions waiving the obligations for annual redemption for three years and modifying their rights against the company and its property. Owing to the continued depression in the heavy industries, it was found impossible for the company to continue working except at a loss, and the furnaces have been out of operation for over two years. The plant was maintained in such condition that it could be put into operation as soon as conditions permitted, but it has become apparent that there is no immediate prospect of the works restarting. The moratorium period has now come to an end, and it has been necessary for the trustees to take possession of the premises charged by the trust deed. Mr. James Kilpatrick has been appointed receiver on behalf of the debenture holders.

Contracts Open.

Birkenhead, March 3.—Iron and steel stores, for the Corporation. The Water Engineer, 601, Borough Road, Birkenhead.

Bletchley, February 22.—1,750 yds. of cast-iron spigot and socket pipes, for the Urban District Council. Mr. F. E. Capper, clerk, Bletchley. (Fee £1, returnable.)

Cape Town, S.A., April 2.—Five sets of centrifugal pumps, etc., for the Cape Town Electricity Department. The Department of Overseas Trade. (Reference A.X. 9,096.)

Haywards Heath, March 5.—490 tons of cast-iron socket and spigot pipes and specials, for the Mid-Sussex Joint Water Board. Mr. F. Martin, engineer, Boltro Road, Haywards Heath. (Fee £2 2s., returnable.)

Neston, Cheshire, February 24.—4,000 yds. of cast-iron pipes, etc., for the Neston and Parkgate Urban District Council. Mr. H. B. Ward, 26, North John Street, Liverpool. (Fee £3 3s., returnable.)

Vienna, March 1.—Diesel or semi-Diesel motor-vessel, for the International Danube Commission. The Department of Overseas Trade. (Reference A.X. 9,083.)

Obituary.

Mr. Gething Lewis, J.P., head of the Bute Works Supply Company, Limited, wagon builders and repairers, Cardiff, of which he was the founder, died on Friday, February 7, aged 76.

Personal.

Mr. A. H. Smethurst has, by ballot, been re-elected general secretary of the Amalgamated Engineering Union.

Sir George O. Thurston, it is announced, has decided to resign from the board of Messrs. Vickers-Armstrongs, Limited, although he is to maintain close association with the company as a consulting naval architect.

Mr. Andrew Laing, of the Wallsend Slipway & Engineering Company, Limited, has been elected an Honorary Fellow of the North-East Coast Institution of Engineers and Shipbuilders, "in recognition of the great and beneficial influence he has had on marine engineering."

A deputation representing the directors, staff and employees of Messrs. John Williams & Company (Wishaw), 1922, Limited, waited upon Mr. Thomas Harvey, lately managing director of the company, to present him with gifts in recognition of his 35 years' service with the company. Mr. Harvey has recently been appointed managing director of the Motherwell Iron & Steel Company, Limited.

Sir James Lithgow, Bt., the well-known shipbuilder, has been nominated as President-elect of the Federation of British Industries, in succession to Mr. Lennox B. Lee, who has held office for the past year. Sir Arthur Duckham and Sir Hugo Hirst, Bt., have been nominated as new Vice-Presidents of the Federation. Sir James Lithgow directs, in conjunction with his brother, the largest private shipbuilding business in the world. Besides the work of his own firm, he takes an active part in the affairs of the shipbuilding industry, and was President of the Clyde Shipbuilding Association as long ago as 1912. He became President of the Shipbuilding Employers' Federation in 1921-22, and then extended his sphere of activity to wider industrial questions, being elected Vice-President and then President of the National Confederation of Employers' Organisations. He was also a delegate of the British employers to the International Labour Conference at Geneva. He has been a member of the Central Electricity Board since its formation in 1927.

Some Aspects of Jobbing Moulding.

(*Continued from page* 138.)

filled, there was a tendency for the scum to adhere to the sides and not to rise?

Mr. Southcott replied that the tendency of metal, when a ring was filling, was to roll as it rose, and that when this took place all scum and scruff which floated on the top became entrapped at the sides—hence the reason for the swirling-gate to keep at the top of the metal all scum, etc. Furthermore, it did away with the very bad practice of stirring with feeding-rods.

Mr. Wall asked why, if the pencil-runners on top for a cylinder were such a success as the lecturer told them, he did not use them for piston-ring castings or swirling-gates for cylinders? There were buyers who would have nothing else than top-run piston rings made in dry sand.

Mr. Southcott replied that to use pencil-gates on top of all piston rings would be adding such an expense as to make it impracticable. Then, the use of bottom swirling-gates on cylinders was a different proposition. In the cylinder there were too many obstacles to overcome, which were not found in piston rings, and, by attempting to give the swirling motion, they would, he was afraid, defeat their object; the metal would swirl until it came in contact with the top edge of the flange, then the port cores, and by the time it had reached those all swirling action would be finished.

Mr. Williams, in proposing a vote of thanks, said it was quite a pleasure to hear a practical moulder giving his own ideas and experiences to a body of fellow-workmen. It was quite a change from the past. This was passed enthusiastically; Mr. Southcott suitably responding.

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If the British Government imposed

AN EXCISE DUTY OF TEN SHILLINGS A TON ON BRITISH STEEL CASTINGS

would it be fair to British Steel Founders if the Government permitted the import of foreign castings without imposing on them a duty of a similar amount.

?

And yet, in a lesser degree, that is the exact position to-day.

The cost of British Steel Castings, and of the ingredients used in producing them, is the cost of the labour employed, just that, neither more nor less.

That cost is the standard rate that must be paid PLUS the burdens laid on it by the British Government, as for instance, Health and Unemployment Insurance.

THERE ARE NO SUCH BURDENS ON IMPORTED CASTINGS, THE RATE OF WAGES PAID IN THEIR PRODUCTION IS FAR BELOW BRITISH STANDARD RATES AND YET THEY ENTER BRITAIN FREE OF ALL DUTY!!

Isn't the British Refractories Industry suffering from exactly the same cause?

THE PRODUCTION OF "YORKSHIRE SAND" USES BRITISH STEEL AND IRON, AND FINDS CONSTANT EMPLOYMENT FOR BRITONS WHO WOULD OTHERWISE HAVE TO BE MAINTAINED IN IDLENESS BY THE NATION.

Ought not the British Steel Trade and the British Sand Trade to stand shoulder to shoulder for mutual support? Apart from that, there is nothing in the way of Sand, as good as "Yorkshire Sand" for Steel Castings.

WE SUBMIT THE PROPOSITION TO YOUR CONSIDERATION.

Make a point of visiting our Stand No. 1, Row 11b, in the Gas Industries Section of the British Industries Fair, Birmingham, 17th to the 28th of February.

Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—The tone of the Cleveland iron markets continues one of unrelieved dulness, very little fresh business being booked, and that only for consumers' urgent requirements and in limited tonnages. The belief is held by consumers that prices of Cleveland iron are disproportionate, and that ultimately the ironmasters must grant concessions in prices or reduce furnace production, with the alternative of accumulating stocks of pig-iron in their possession. At present there is only a limited outlet for iron for export, while Scottish consumers are buying material freely from abroad as well as from Midland sources, to the exclusion of Cleveland products. It is, however, reported that the Tees-side ironmasters have secured certain business in Scotland by quoting a reduced price, inclusive of freight charges, but the official minima are still unchanged as follow:—No. 1 Cleveland foundry iron, 75s.; No. 3 G.M.B., 72s. 6d.; No. 4 foundry, 71s. 6d.; No. 4 forge, 71s. per ton.

Some slight improvement may be noted in the market for East-Coast hematite, a few sales to Sheffield and South Wales having been reported, and generally this has exercised a steadying influence. Prices are still somewhat variable, with current quotations ruling at about 78s. per ton for mixed numbers, with an extra 6d. per ton for No. 1 quality. On the North-West Coast, Bessemer mixed numbers are still quoted at 79s. per ton at works.

LANCASHIRE.—The demand from the foundries in this area is by no means uniformly good, the call for iron from speciality firms being rather better than from general engineers and makers of textile machinery. Prices remain firmly stabilised for the present, quotations for Midland brands of No. 3 Derbyshire and Staffordshire being still on the basis of 77s. per ton, with Scottish iron steady at 95s. per ton, delivered locally.

THE MIDLANDS.—In the South Staffordshire area also there has been no improvement in the market situation. Very few consumers are prepared at this juncture to enter into forward agreements, and conditions are quiet and uneventful. Prices remain stationary, but in all cases only the minimum zone rates can be obtained, namely, 75s. for Northants No. 3 and 78s. 6d. for North Staffordshire and Derbyshire No. 3, delivered to Birmingham and Black Country stations.

SCOTLAND.—Business continues to move quietly in the Scottish pig-iron market. The founders generally are badly off for work, and in the Falkirk district most of them are on short time, working only three to four days per week. Consequently, their consumption of pig-iron has gone down, and, whilst most of them have their requirements covered until June, they are getting in arrears in taking out the iron contracted for. The price of No. 3 Scotch iron is still at the official minimum of 78s. f.o.t. furnaces.

Finished Iron.

At Birmingham this week business in crown and nut and bolt iron remains very quiet. The works are not able to secure sufficient tonnage to keep their mills going with any degree of regularity, and there is a great deal of price-cutting for business emanating from this district. Crown bars are offered at from £10 to £10 10s., and nut and bolt bars at £9 2s. 6d. to £9 7s. 6d. Very little support is possible to the local mills for nut and bolt iron on account of the continued low prices quoted by Belgian makers.

Steel.

At Sheffield the position in the steel market is one of expectation, and in the meantime the volume of business is small. Soft basic steel billets continue to be the best feature, although other descriptions are in fair demand. Siemens acid billets show no improvement. Wire rods are a moderate market, but Continental competition is more pronounced.

Scrap.

Dealings in foundry scrap metals just now are on a moderate scale, and on the North-East Coast only very small parcels of ordinary heavy cast iron are changing hands at 62s. 6d., although 66s. 6d. per ton may still be obtainable for machinery quality in handy sizes. In the Midlands the demand for cast-iron scrap is rather better than for heavy steel scrap. For heavy machinery cast-iron scrap 70s. per ton is still offered by the local foundries, while ordinary heavy cast-iron is realising 65s. per ton. Light cast iron, however, is weak at 60s. per ton delivered. In Scotland the cast-iron scrap market is steady, and heavy machinery cast iron is still at around 70s., with ordinary heavy cast at 5s. less. Steelworks cast iron is quoted at 61s. 3d. to 62s. 6d., but there are few buyers. Old cast-iron railway chairs are unchanged at 66s. 6d.

Metals.

Copper.—Movements in the market for warrant copper of late have taken a rather erratic turn, prices fluctuating sharply. There is little change, however, in the general position.

Closing quotations are :—

Cash.—Thursday, £71 15s. to £72; Friday, £70 10s. to £71; Monday, £69 10s. to £69 15s.; Tuesday, £70 5s. to £70 7s. 6d.; Wednesday, £70 to £70 2s. 6d.

Three Months.—Thursday, £68 17s. 6d. to £69 2s. 6d.; Friday, £68 5s. to £68 7s. 6d.; Monday, £67 17s. 6d. to £68; Tuesday, £68 to £68 2s. 6d.; Wednesday, £68 2s. 6d. to £68 5s.

Tin.—Renewed disappointment was reflected in last week's market for standard tin, when, instead of the confidently anticipated advance, the metal declined The existence of large stocks is the chief factor restraining the market.

Official closing prices :—

Cash.—Thursday, £173 15s. to £173 17s. 6d.; Friday, £172 15s. to £172 17s. 6d.; Monday, £174 5s. to £174 7s. 6d.; Tuesday, £173 10s. to £173 15s.; Wednesday, £174 5s. to £174 7s. 6d.

Three Months.—Thursday, £176 12s. 6d. to £176 5s.; Friday, £175 12s. 6d. to £175 17s. 6d.; Monday, £177 5s. to £177 7s. 6d.; Tuesday, £176 10s. to £176 12s. 6d.; Wednesday, £177 5s. to £177 10s.

Spelter.—So far, the current month has not developed signs of increased activity in the market for spelter. The consumptive demand is poor, and little business has been passing.

Daily quotations are :—

Ordinary.—Thursday, £19 11s. 3d.; Friday, £19 11s. 3d.; Monday, £19 7s. 6d.; Tuesday, £19 5s.; Wednesday, £18 16s. 3d.

Lead.—The market for soft foreign pig continues steady and prices are well controlled. Trade has been fairly good.

The week's prices have been :—

Soft Foreign (Prompt).—Thursday, £21 12s. 6d.; Friday, £21 12s. 6d.; Monday, £21 12s. 6d.; Tuesday, £21 12s. 6d.; Wednesday, £21 5s.

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11 ACRES WORKS SITE.
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145,000 Sq. Ft. of SHOPPING,
Compact and Convenient.
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WELL-BUILT & COMMODIOUS OFFICES
Will Sell whole or in lots to suit customers or Let on favourable terms. Unique opportunity for Manufacturers.
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FOUNDRY GRINDING WHEELS
CARBORUNDUM WHEELS *for Iron, Brass, Bronze, Aluminium, etc.*
ELECTRITE "A" WHEELS *for Steel, Wrought Iron, Malleable, etc.*
GRAINS & POWDERS *for buffing* :: BRICKS :: DISCS.
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STAND UP TO THEIR WORK BECAUSE THEY ARE MADE FROM

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THEY ARE LIGHT AND EASY TO HANDLE, STRONG, RIGID AND PERMANENTLY ACCURATE.

There is no greater economy you can introduce into your foundry than the

Sterling Rolled Steel Moulding Box

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WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	70	0	0
Three months	68	2	6
Electrolytic	83	10	0
Tough	76	15	0
Best selected	77	5	0
Sheets	110	0	0
India	90	0	0
Wire bars	84	5	0
Do. Feb.	84	5	0
Do. March.	84	5	0
Ingot bars	84	5	0
H.C. wire rods	86	5	0
Off. av. cash, January	71	11	1 3/4
Do., 3 mths., January	69	0	2 1/2
Do., Sttlmnt., January	71	10	8 3/4
Do., Electro, January	83	10	9 5/8
Do., B.S., January	77	3	7 1/2
Do., wire bars, January	83	16	7 1/4
Aver. spot price, copper, Jan.	71	11	1 3/4
Solid drawn tubes			15d.
Brazed tubes			15d.
Wire			11 1/4d.

BRASS.

Solid drawn tubes	12 1/2d.
Brazed tubes	14 1/2d.
Rods, drawn	12 1/2d.
Rods, extd. or rlld.	7 1/2d.
Sheets to 10 w.g.	11 1/2d.
Wire	10 7/8d.
Rolled metal	10 1/2d.
Yellow metal rods	7 1/2d.
Do. 4 × 4 Squares	8d.
Do. 4 × 3 Sheets	8 1/4d.

TIN.

	£	s.	d.
Standard cash	174	5	0
Three months	177	5	0
English	175	5	0
Bars	176	10	0
Straits	175	15	0
Australian	174	10	0
Eastern	179	2	6
Banca	177	10	0
Off. av. cash, January	175	10	10 1/2
Do., 3 mths, January	178	15	2 5/8
Do., Sttlmt., January	175	10	5 5/8
Aver. spot, January	175	10	10 1/2

SPELTER.

	£	s.	d.
Ordinary	18	16	3
Remelted	17	10	0
Hard	15	17	6
Electro 99.9	21	10	0
English	19	12	6
India	17	5	0
Zinc dust (Nom.)	30	0	0
Zinc ashes	6	0	0
Off. aver., January	19	18	9
Aver., spot, January	19	12	8 1/2

LEAD.

	£	s.	d.
Soft foreign ppt.	21	5	0
English	22	15	0
Off. average, January	21	11	1 3/4
Average spot, January	21	10	10 1/2

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	29	0	0
Do. V.M. ex-whf.	27	0	0
Rods	33	0	0
Boiler plates	26	0	0
Battery plates	26	10	0

ANTIMONY.

	£	s.	d.
Special brands, Eng.	46	10	0
Chinese	30	10	0
Crude	18	0	0

QUICKSILVER.

	£	s.	d.
Quicksilver	23	2	6

FERRO-ALLOYS AND STEEL-MAKING METALS.

	£	s.	d.
Ferro-silicon—			
25%	7	17	6
45/50%	11	10	0
75%	19	0	0
Ferro-vanadium—			
35/50%	12/9 lb. Va.		
Ferro-molybdenum—			
70/75% c. free	4/2 lb. Mo.		
Ferro-titanium—			
23/25% carbonless	9d. lb.		
Ferro-phosphorus, 20/25%	£16	0	0
Ferro-tungsten—			
80/85%, c. fr.	3/1 1/2 lb.		
Tungsten metal powder—			
98/99%	3/4 1/2 lb.		
Ferro-chrome—			
2/4% car.	£30	7	6
4/6% car.	£23	7	6
6/8% car.	£22	12	6
8/10% car.	£22	2	0
Ferro-chrome—			
Max. 2% car.	£33	15	0
Max. 1% car.	£38	0	0
Max. 0.70% car.	£40	10	0
70% carbonless	11d. lb.		
Nickel—99% cubes, or pellets	£175	0	0
Ferro-cobalt	9/6 lb.		
Aluminium 98/99%	£95	0	0
Metallic chromium—			
96/98%	2/7 lb.		
Ferro-manganese (net)—			
76/80% loose	£12	10	0
76/80% packed	£13	10	0
76/80% export	£12	15	0
Metallic manganese—			
94/96%, carbonless	1/4 lb.		

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

	£	s.	d.
Finished bars, 14% tungsten	£0	2	0
Finished bars, 18% tungsten	£0	2	9

Per lb. net, d/d buyers' works.

Extras—

Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under 1/4 in. to 1/2 in.	3d. lb.
Do., under 1/2 in. to 1/8 in.	1/- lb.
Flats, 1/4 in. × 1/2 in. to under 1 in. × 1/4 in.	3d. lb.
Do., under 1/2 in. × 1/2 in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

	£	s.	d.	£	s.	d.
South Wales—						
Heavy steel	3	6	0	to 3	7	6
Bundled steel and shrngs.	3	2	6	to 3	5	0
Mixed iron and steel	3	2	6	to 3	4	0
Heavy cast iron	2	18	6	to 3	0	0
Good machinery for foundries				3	2	6
Cleveland—						
Heavy steel				3	3	6
Steel turnings				2	16	6
Cast-iron borings				2	13	0
Heavy forge				3	15	0
W.I. piling scrap				3	10	0
Cast-iron scrap	3	2	6	to 3	6	6
Midlands—						
Ord. cast-iron scrap				3	5	0
Heavy wrought				3	17	6
Steel turnings				2	5	0
Scotland—						
Heavy steel				3	6	0
Cast-iron borings				2	10	0
Wrought-iron piling				4	0	0
Heavy machinery				3	10	0

London—Merchants' buying prices delivered yard.

	£	s.	d.
Copper (clean)	61	0	0
Brass	43	0	0
Lead (less usual draft)	20	0	0
Tea lead	16	0	0
Zinc	13	0	0
New aluminium cuttings	65	0	0
Braziery copper	57	0	0
Gunmetal	54	0	0
Hollow pewter	130	0	0
Shaped black pewter	97	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	75/-
Foundry No. 3	72/6
Foundry No. 4	71/6
Forge No. 4	71/-
Hematite No. 1	78/6
Hematite M/Nos.	78/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	87/-
„ d/d Birm.	95/6
Midlands—	
Staffs. common*	—
„ No. 4 forge*	74/6
„ No. 3 fdry.*	78/6
Shrops. basic	—
„ Cold blast, ord.	—
„ „ roll iron	—
Northants forge*	71/-
„ fdry. No. 3*	75/-
Derbyshire forge*	74/6
„ fdry. No. 3*	78/6
„ basic*	—

*d/d Black Country dist.

Scotland—	
Foundry No. 1	80/6
„ No. 3	78/-
Hem. M/Nos.	81/-
Sheffield (d/d district)—	
Derby forge	69/6
„ fdry. No. 3	73/6
Lincs. forge.	71/6
„ fdry No. 3	75/6
E.C. hematite	89/-
W.C. hematite	91/6
Lincs. (at furnaces)—	
Forge No. 4	—
Foundry No. 3	—
Basic	—
Lancashire (d/d eq. Man.)—	
Derby forge	—
„ fdry. No. 3	77/-
Northants foundry No. 3	—
Dalzell, No. 3 (special)	105/- to 107/6
Summerlee, No. 3	95/-
Glengarnock, No. 3	—
Gartsherrie, No. 3	95/-
Monkland, No. 3	95/-
Shotts, No. 3	95/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

	£	s.	d.	£	s.	d.
Iron—						
Bars (cr.) nom.				10	15	0
Nut and bolt iron	9	2	6	to 9	7	6
Hoops	10	15	0	to 11	5	0
Marked bars (Staffs) f.o t.				12	10	0
Gas strip	10	15	0	to 11	5	0
Bolts and nuts, 1/4 in. × 4 in.				15	5	0
Steel—						
Ship plates	8	15	0	to 8	17	6
Boiler plts.	9	17	6	to 10	10	0
Chequer plts.				10	12	6
Angles				8	7	6
Tees				9	7	6
Joists				8	10	0
Rounds and squares, 3 in. to 5 1/2 in.				9	7	6
Rounds under 3 in. to 1/4 in. (Untested)				8	2	6
				and upwards		
Flats—8 in. wide and over				8	12	6
„ under 8 in. and over 5 in.				8	17	6
Rails, heavy				8	10	0
Fishplates	12	0	0	to 12	10	0
Hoops (Staffs)	9	10	0	to 9	15	0
Black sheets, 24 g.				9	15	0
Galv.cor.shts., 24g.	11	15	0	to 12	0	0
Galv. fencing wire, 8g. plain				12	0	0
Billets, soft	6	2	6	to 6	12	6
Billets, hard	7	10	0	to 8	0	0
Sheet bars	5	17	6	to 6	5	0
Tin bars	5	17	6	to 6	5	0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	1/4
Sheet to 10 w.g.	1/5
Wire	1/6
Rods	1/5
Tubes	1/9 1/2
Castings	1/4

Delivery 3 cwt. free.
10% phos. cop. £40 above B.S.
15% phos. cop. £50 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. Clifford & Son, Limited.

NICKEL SILVER, &c.

	per lb.
Ingots for raising	10d. to 1/4
Rolled—	
To 9 in. wide	1/4 to 1/10
To 12 in. wide	1/4 1/2 to 1/10 1/2
To 15 in. wide	1/4 1/2 to 1/10 1/2
To 18 in. wide	1/5 to 1/11
To 21 in. wide	1/5 1/2 to 1/11 1/2
To 25 in. wide	1/6 to 2/-
Ingots for spoons and forks	10d. to 1/6 1/2
Ingots rolled to spoon size	1/1 to 1/9 1/2
Wire round—	
3/0 to 10 G.	1/7 1/2 to 2/2 1/2

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2X foundry, Phila.	20.76
No. 2 foundry, Valley	18.50
No. 2 foundry, Birm.	14.50
Basic	20.26
Bessemer	20.76
Malleable	20.76
Grey forge	19.76
Ferro-mang. 80% d/d	100.00
O.-h. rails, h'y, at mill	43.00
Bessemer billets	33.00
O.-h. billets	35.00
O.-h. sheet bars	33.00
Wire rods	40.00
	Cents.
Iron bars, Phila.	2.12
Steel bars	1.85
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.85
Skelp, sheared steel	1.85
Steel hoops	2.20
Sheets, black, No. 24	2.60
Sheets, galv., No. 24	3.30
Sheets, blue an'l'd, No. 13	2.25
Wire nails	2.25
Plain wire	2.40
Barbed wire, galv.	2.95
Tinplates, 100-lb. box	$5.25

COKE (at ovens).

Welsh foundry	30/- to 35/-
„ furnace	30/- to 32/-
Durham and Northumberland—	
„ foundry	17/- to 17/6
„ furnace	19/- to 19/6
Midlands, foundry	—
„ furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 box	18/6
„	28×20 „	37/-
„	20×10 „	26/6
„	18 3/4×14 „	19/3
C.W.	20×14 „	16/-
„	28×20 „	34/3
„	20×10 „	23/6
„	18 3/4×14 „	17/-
Terneplates	28×20	32/6 per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0	to	£7	10 0
Bars, hammered, basis	£17	10	0	to	£18	10 0
Bars and nail-rods, rolled, basis	£15	17	6	to	£16	15 0
Blooms	£10	0	0	to	£12	0 0
Keg steel	£32	0	0	to	£33	0 0
Faggot steel	£20	0	0	to	£24	0 0
Bars and rods dead soft, steel	£11	0	0	to	£14	0 0

All per English ton, f.o.b. Gothenburg.

XUM

TUBES AND FITTINGS.

Over ½ in. up to 6 in.

	Tubes.	*Fittings.*
Gas	65%	47½%
Water	61¼%	42½%
Steam	57½%	37½%

W.I. 10% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

			£	s.	d.	
Feb.	13	..	71	15	0	dec. 50/–
,,	14	..	70	10	0	,, 25/–
,,	17	..	69	10	0	,, 20/–
,,	18	..	70	5	0	inc. 15/–
,,	19	..	70	0	0	dec. 5/–

Electrolytic Copper.

			£	s.	d.	
Feb.	13	..	83	10	0	No change
,,	14	..	83	10	0	,, ,,
,,	17	..	83	10	0	,, ,,
,,	18	..	83	10	0	,, ,,
,,	19	..	83	10	0	,, ,,

Standard Tin (cash).

			£	s.	d.	
Feb.	13	..	173	15	0	dec. 12/6
,,	14	..	172	15	0	,, 20/–
,,	17	..	174	5	0	inc. 30/–
,,	18	..	173	10	0	dec. 15/–
,,	19	..	174	5	0	inc. 15/–

Tin (English ingots).

			£	s.	d.	
Feb.	13	..	174	15	0	dec. 15/–
,,	14	..	173	15	0	,, 20/–
,,	17	..	175	5	0	inc. 30/–
,,	18	..	174	10	0	dec. 15/–
,,	19	..	175	5	0	inc. 15/–

Zinc Sheets (English).

			£	s.	d.	
Feb.	13	..	29	0	0	No change
,,	14	..	29	0	0	,, ,,
,,	17	..	29	0	0	,, ,,
,,	18	..	29	0	0	,, ,,
,,	19	..	29	0	0	,, ,,

Spelter (ordinary).

			£	s.	d.	
Feb.	13	..	19	11	3	dec. 2/6
,,	14	..	19	11	3	No change
,,	17	..	19	7	6	dec. 3/9
,,	18	..	19	5	0	,, 2/6
,,	19	..	18	16	3	,, 8/9

Lead (English).

			£	s.	d.	
Feb.	13	..	23	0	0	No change
,,	14	..	23	0	0	,, ,,
,,	17	..	23	0	0	,, ,,
,,	18	..	23	0	0	,, ,,
,,	19	..	22	15	0	dec. 5/–

AVERAGE MONTHLY PRICES OF STEEL SHIP ANGLES (NORTH OF ENGLAND).

Year.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1896	4 15 0	4 17 6	5 0 0	5 0 0	5 0 0	4 17 6	4 17 6	4 17 6	4 17 6	5 0 0	5 7 6	5 7 6	4 19 9½
1897	5 7 6	5 7 6	5 7 6	5 5 0	5 0 0	5 0 0	5 2 6	5 2 6	5 2 6	5 2 6	5 0 0	5 5 0	5 3 5½
1898	5 5 0	5 5 0	5 5 0	5 7 6	5 13 9	5 15 0	5 15 0	5 15 0	5 17 6	6 0 0	6 5 0	6 7 6	5 14 3
1899	6 10 0	6 12 6	6 15 0	6 15 0	6 17 6	6 17 6	7 0 0	7 5 0	7 5 0	7 5 0	7 12 6	7 15 0	7 0 5
1900	7 15 0	8 0 0	8 2 6	8 5 0	8 5 0	8 7 6	8 7 6	8 2 6	8 2 6	8 0 0	7 10 0	7 10 0	8 0 7½
1901	6 15 0	6 12 6	6 5 0	6 0 0	6 0 0	5 10 0	5 15 0	5 17 6	6 0 0	5 17 6	5 17 6	5 15 0	6 0 5
1902	5 12 6	5 10 0	5 10 0	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 7 6	5 11 8
1903	5 6 3	5 6 3	5 7 6	5 12 6	5 12 6	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 0 0	5 8 9
1904	5 0 0	4 17 6	5 2 6	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 0 0	5 0 0	5 0 0	5 5 0	5 2 6
1905	5 5 0	5 7 6	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 12 6	6 2 6	6 12 6	6 12 6	5 14 4½
1906	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	7 2 6	6 13 4
1907	6 17 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	7 2 6	6 12 6	6 12 6	7 0 5
1908	6 2 6	6 2 6	6 2 6	5 17 6	5 17 6	5 17 6	5 17 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 16 3
1909	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 7 6	5 7 6	5 7 6	5 7 6	5 7 6	5 7 6	5 7 6	5 9 7
1910	5 16 3	5 17 6	5 17 6	6 1 6	6 2 6	6 2 6	6 2 6	6 2 6	6 2 6	6 7 6	6 7 6	6 7 6	6 2 3½
1911	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 7 6	6 9 0	6 7 8½
1912	6 16 3	6 17 6	6 17 6	7 5 0	7 7 6	7 7 6	7 7 6	7 12 6	7 12 6	7 12 6	7 14 6	7 17 6	7 7 4½
1913	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 7 6	7 7 6	6 15 6	6 7 6	6 2 6	7 8 11½
1914	6 2 6	6 2 6	6 2 6	6 2 6	6 2 6	5 15 0	5 15 0	6 15 0	7 0 0	7 0 0	7 1 3	7 5 0	6 8 7½
1915	7 17 0	8 5 0	8 17 6	9 5 0	9 5 0	9 15 0	9 15 0	9 15 0	9 15 0	9 15 0	10 15 0	10 15 0	9 8 3½
1916	11 3 1½	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
1917	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6
1918	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6	11 2 6½
1919	11 2 6	13 12 6	13 12 6	13 12 6	17 2 6	17 1 3	17 0 0	17 15 0	17 15 0	17 15 0	17 17 6	18 5 0	16 1 9
1920	19 10 0	20 0 0	21 10 0	22 0 0	23 5 0	24 0 0	24 0 0	24 0 0	24 15 0	24 10 0	24 0 0	24 0 0	22 19 2
1921	22 10 0	20 12 6	19 0 0	17 10 0	17 10 0	16 6 0	14 10 0	14 3 4	13 10 0	11 15 0	10 0 0	9 12 6	15 11 7
1922	9 17 6	10 0 0	10 0 0	10 0 0	10 0 0	9 17 6	9 10 0	8 15 7½	8 14 0	8 12 6	8 12 6	8 12 6	9 7 8½
1923	8 18 1½	9 1 3	9 14 0	10 0 0	10 0 0	10 0 0	9 8 9	9 9 6	9 10 0	9 8 9	9 11 6	9 18 9	9 11 8½
1924	10 0 0	9 18 1½	9 17 6	9 17 6	9 17 2	9 11 3	9 15 0	9 15 0	9 9 4½	9 6 6	9 5 0	9 5 0	9 13 1½
1925	9 2 0	9 0 11½	9 0 0	8 15 9	8 10 3½	8 9 0½	8 6 3	8 2 6	7 19 0½	7 12 3	7 5 0	7 2 6	8 5 5½
1926	7 2 6	7 2 6	7 2 6	7 3 4	7 2 6	7 3 9	7 7 6	7 8 5½	7 9 0	7 12 6	7 16 3	8 0 6	7 7 7½
1927	7 18 9	7 17 6	7 17 6	7 14 8½	7 18 9	7 12 6	7 12 6	7 12 6	7 12 6	7 12 6	7 12 6	7 12 6	7 14 1½
1928	7 12 6	7 14 9	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 17 6	7 16 10½
1929	7 17 6	7 17 6	7 17 6	7 17 6	8 0 6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 2 6	8 5 0	8 1 1
1930	8 7 6	—	—	—	—	—	—	—	—	—	—	—	—

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XUM

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